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MECCANO MAGAZINE

PUBLISHED
IN THE INTERESTS
OF BOYS

EDITORIAL

OUR cover this month shows a huge Steel Casting for a Rolling Mill for steel. The photograph, kindly supplied by the makers of the Mill, Messrs. Davy Bros. Ltd., of Sheffield, has been coloured by our artist in a most realistic manner. The Casting is shown standing on the bed-plate of what is called a "Side Planing Machine." This is provided with the usual vertical and horizontal movements, the portion of the machine shown on the left-hand side of the Casting being the vertical slide. The Casting was produced from a Siemens-Martin Open-Hearth Furnace, and it forms one of a pair of Castings in which are housed the rolls of a "three-high" Rolling Mill. In these mills there are three rolls 9 ft. in length, the top and bottom being 3 ft. in diameter and the middle roll 2 ft. in diameter. The Mill is used for rolling pieces of steel weighing from four to six tons, the steel being passed through the rolls time after time until it is reduced from a thickness of 14 in. to plates varying from $\frac{1}{8}$ in. to $1\frac{1}{4}$ in. in thickness. I have given these details in the endeavour to give some idea of the great size and strength of these rolling mills, which will be dealt with in greater detail in a subsequent instalment of our article "*The Story of Iron and Steel.*" Although the methods used in the treatment of steel are very wonderful, we must not overlook the ingenuity displayed in the construction of such huge macnines as these Rolling Mills, without which the manipulation of great masses of metal would not be possible.

Our Cover

I do not know whether all my readers know that the "*M.M.*" has been published in France for a number of years. It has a wide circulation and the French Meccano boys are keenly interested in their "*M.M.*", which follows the lines of our own publication. Readers who wish to improve their French should become subscribers to the French Magazine, as they will no doubt find it interesting to follow the "*M.M.*" articles in the French language. I imagine, too, that they would find it considerably more interesting to improve their French by reading about Meccano boys than in translating from school-books! I shall be pleased to send particulars and subscription rates to any boy interested.

The "M.M" in France

This reminds me that the Correspondence Club, which is organised in connection with the Guild, is doing very excellent work. No charge is made for enrolment in this club, this being one of the privileges of Guild members. The Correspondence Club offers a wonderful opportunity for every boy to have a friend in any country abroad, or in any town or city in England. Stamps, post-cards, and photographs may be exchanged, and correspondence arranged in English or in the language of the country in which the correspondent lives. Here again is a splendid opportunity for my readers to improve any foreign language that they are studying, and correspondents will find it very interesting to exchange views and ideas about Meccano with their friends overseas. If they like to do so, they may ask for letters to be returned corrected by their correspondents, a procedure that is often very helpful. Any boy who desires to become a member of the Correspondence Club, and to be placed in touch with a suitable correspondent, should write to the Guild Secretary for full particulars and enrolment form.

Our Correspondence Club

Since the *Meccano Magazine* was first published, eight years ago, I have received tens of thousands of enquiries on all manner of subjects. As a rule I welcome these enquiries, and am pleased to be able to give my readers information and to clear up their difficulties. At one time the enquiries bore a distinct relation to engineering and other similar subjects with which Meccano is more closely associated, but during the last year or two the questions I have received have covered a much wider field. I have been asked for information on all manner of subjects, the nature of which would, no doubt, surprise most of the readers of the "*M.M.*" One morning recently I opened a letter from a young friend asking for information as to what to feed tadpoles on, while the the next letter asked me to "recommend something for a baby's cough," as my correspondent's baby-brother was very ill! I have also been asked many posers, such as: What causes a shell to drift sideways when it is fired? What book would you recommend for an elementary study of Hydraulics? Does sand conduct sound? Which is the longest single-span bridge in the world? How much heat and light do we receive from Jupiter? How can I bore holes in glass without breaking it? How is horse-power calculated, and what is the difference between the several formulæ? Another poser was contained in a letter which said: "I am very interested in the Forth Bridge, but please will you tell me what keeps it up?"

Some Queer Questions

To such questions as these I do not take exception, as most of them are more or less connected with Engineering and Mechanics, and I feel that my correspondents are really in search of information. Questions were made to be answered, and difficulties to be overcome, and information on any point can nearly always be obtained from a Reference Library, a Lending Library or some other similar source to be found in almost every town. A good Encyclopædia will often give the desired information; and whilst I am always ready to give assistance in these matters, I hope that readers will first endeavour to "help themselves" by discovering answers to their questions before they invite my assistance.

Help Yourself

Whilst on this subject I will mention another class of readers who often ask trifling questions on trifling subjects, and seem to take a real delight trying to cause the Editor a great deal of trouble. These include such questions as: How do you explain the cutting up of a draught board measuring 8 inches square into pieces that fit together in two rectangles with an apparent area of 65 square inches, when $8 \times 8 = 64$? Did the "*Titanic*" reach the bottom of the ocean, or does she hang suspended half-way to the bottom? If a bullet is shot from the back of a moving train, at a speed equal to that of the train, what happens to it? If an explosion occurs when there is no one within ear-shot can there be said to be any sound? Some of these questions I recognise at once as "chestnuts," which I suppose have been sent to Editors of other papers for many years by different people, apparently with the idea of "setting the Editor a poser." It is surprising how quickly an Editor is able to tell whether questions are asked "just for the fun of the thing" or in real earnest, however, and those in the former category generally find their way into the waste-paper basket!

Posers for the Editor

IMPORTANT

We are constantly asked to supply back numbers of the "*M.M.*" We print only sufficient copies to fill our regular orders, and as a rule back numbers cannot be supplied. In order to prevent disappointment our readers are advised to place a regular order with a Meccano dealer, a newsagent, or direct with us. (Subscription rates on page 276).

Electricity

VII. ELECTRIC POWER STATIONS

FEW things are more impressive and fascinating than a large electric power station. There is an element of mystery about the huge machines working incessantly at enormous speeds and yet producing no visible result. We know that electric current of tremendous power is being produced, but that current is silent and invisible, and only makes its presence known when it lights tens of thousands of lamps and drives innumerable motors in all parts of a great city.

In this country steam is used almost exclusively as the motive force to drive the generators of a large power station. Until recent years the reciprocating engine was in general use, but now the steam turbine has taken its place in up-to-date stations. The turbines are coupled directly to the generators so that the two machines look like one. The advantages of the steam turbine are that it is capable of higher speeds than the reciprocating engine, is more silent in running, occupies less space and requires less attention.

From Coal to Steam

A large central power station consumes vast quantities of coal and requires a plentiful supply of water. For this reason it is built whenever possible on the banks of a river or canal, so that supplies of coal can be brought to its doors cheaply and easily and an ample water supply is at hand. The coal arrives in barges and is unloaded by huge mechanical grabs and deposited in a big receiving hopper. From this hopper it is taken by some form of conveyor to other hoppers close to the furnaces, and is fed into the furnaces by mechanical stokers.

After combustion the ash and clinker fall down great funnel-like chutes directly into trucks below, and are taken away and sold to be made into building and other materials. Even the gases resulting from the combustion of the coal are made to do work before they are allowed to escape through the chimney. These gases are led into an economiser chamber through which pass pipes bringing fresh water to the boilers. Here the gases part with a great deal of their heat, with the result that the water flowing through the pipes is raised to a very high temperature before it reaches the boilers, so that a comparatively small amount of heat is required to turn it into steam.

The heat produced in the furnaces is used to generate steam in a number of great boilers, from which the steam is collected in large pipes and led to the engine-room, where it is distributed to the turbines as required. Having exerted its energy in the turbines it might be thought that the steam would be allowed to escape, but no—a great deal more work is yet required of it. It passes from the turbines to a condenser in which it is cooled and condensed to water, freed from oil and grease, and then sent back to the boilers to be re-converted into steam. This condensed water is quite warm, and therefore less heat is required to turn it into steam than would be the case if the boilers were constantly fed with fresh cold water.

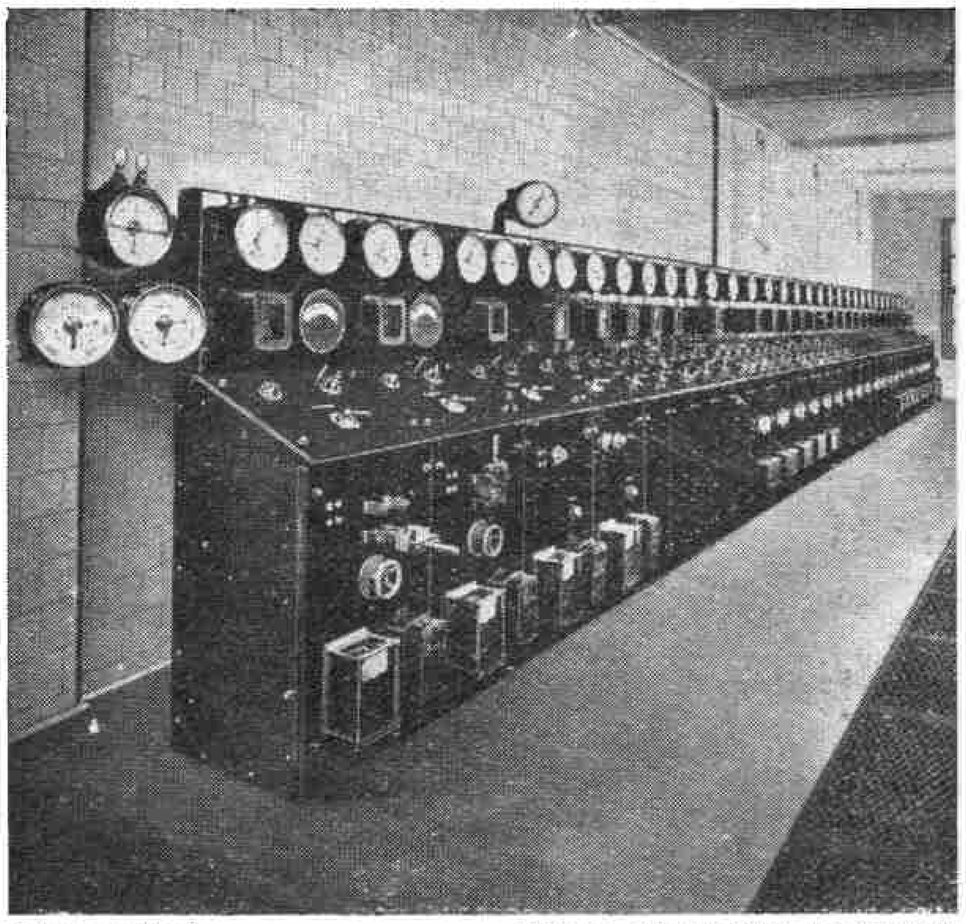

Photo courtesy] [*Messrs. Metropolitan-Vickers Ltd.*

The Switchboard at a Power Station

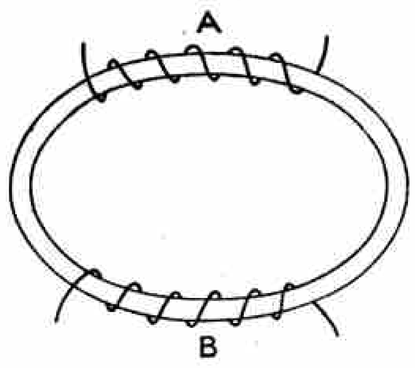

Diagram showing principle of Transformer

Silent Giants at Work

Perhaps the most striking feature of a large power station engine-room where the generators are turbine-driven is the silence. There is none of the clash and clatter one usually associates with rapidly moving machines. The giant turbines, turning at the rate of perhaps 1,000 revolutions per minute, are uncannily quiet, and as one listens to their purring hum it is difficult to realise their enormous power. The generators, too, run very quietly, although they may be developing current capable of supplying the whole of the electrical requirements of a great city.

The current generated is conveyed by heavy copper cables to what are called "bus bars," two of which run along the entire length of a large main switchboard. One receives the positive cable from the generators and the other the negative cable.

The kind of current to be generated at a power station—continuous or alternating—is largely determined by the size of the area supplied. Generally speaking, continuous current is generated for small supply areas and alternating current for larger ones, but there are exceptions, and in many cases both kinds of current are generated at one station.

Continuous Current : Three-Wire System

If continuous current is generated it is usually at a pressure of from 400 to 500 volts, the average being about 440 volts. The distribution is generally on what is known as the three-wire system, which employs two parallel circuits with a common return. Three separate wires are used. The two outer wires are connected respectively to the positive and negative bus bars and carry current at the full voltage of the system. Between these wires is a third and smaller wire connected to a third bar, smaller than the main bars, and not connected to the generators but to earth by way of a large copper plate buried in the ground. The mid-wire is

connected to the positive and negative outer wires respectively by two machines called "balancers." If we suppose the pressure between the outer wires of the system to be 440 volts, then the pressure between the third wire and either of the outer wires will be 220 volts—that is exactly half.

Balancers

Board of Trade regulations prohibit the use of current at a pressure exceeding 250 volts for electric appliances of all kinds intended for ordinary domestic purposes. In a three-wire system such as we are describing, all such appliances would be connected between the mid-wire and one of the outer wires, thus receiving current at 220 volts. It is clearly impossible to ensure that the appliances connected with the positive side of the system shall always take the same amount of current as those connected with the negative side. There is always liable to be a greater load on one side than on the other, and the function of the balancers to which we have just referred is to adjust these differences.

The balancers are machines capable of acting either as dynamos or motors. So long as the current demands on each side of the system exactly equal one another, the balancers have nothing to do and they run light as motors. Let us suppose, however, that a heavy load is thrown on the negative side. The voltage on that side accordingly drops and the voltage on the positive side rises. The balancer on the positive side then runs as a motor and drives the negative side balancer as a dynamo, and thus the excess demand on the negative side is immediately supplied. There are other methods of balancing, but the one we have described gives a sufficiently good idea of the principle involved.

The half-pressure of 220 volts in such a three-wire system is confined to appliances for domestic use, and electric motors for driving trams or machinery of any kind are connected across the outer wires, thus receiving the full voltage of the system.

Batteries of Accumulators

One of the many problems with which central power stations have to contend is that of a constantly fluctuating demand for current. In a system supplying power and light, for instance, the current demand increases very rapidly at a certain time on winter afternoons, because, as the daylight fades, vast numbers of electric lamps are switched on within a very brief period, while the motors driving machinery in factories and workshops are still running at the full. The same thing happens when a fog descends on a city, or in summer when an approaching thunderstorm quickly darkens the sky and lights are switched on accordingly. A sudden and heavy demand for current may also arise in a system supplying power for tramways. If one of the cars has a serious breakdown it holds up all the cars behind it and a long string of cars quickly forms. As soon as the breakdown is repaired all these cars start practically at the same time, and consequently the current demand is momentarily far in excess of the normal.

If a power station is to deal successfully with situations of this kind it obviously must have a reserve of current beyond that normally required. In the case of power stations generating continuous current such a reserve may be provided by means of a large battery of accumulators. The battery is charged during periods of small demand and then, when an abnormally heavy load comes on, the current from the battery is available to take a share of the load and so relieve the generators. Of course, such a battery of accumulators cannot be used where alternating current is generated unless that current, or part of it, is converted to continuous current. In our June issue we gave an illustration of a large power station battery.

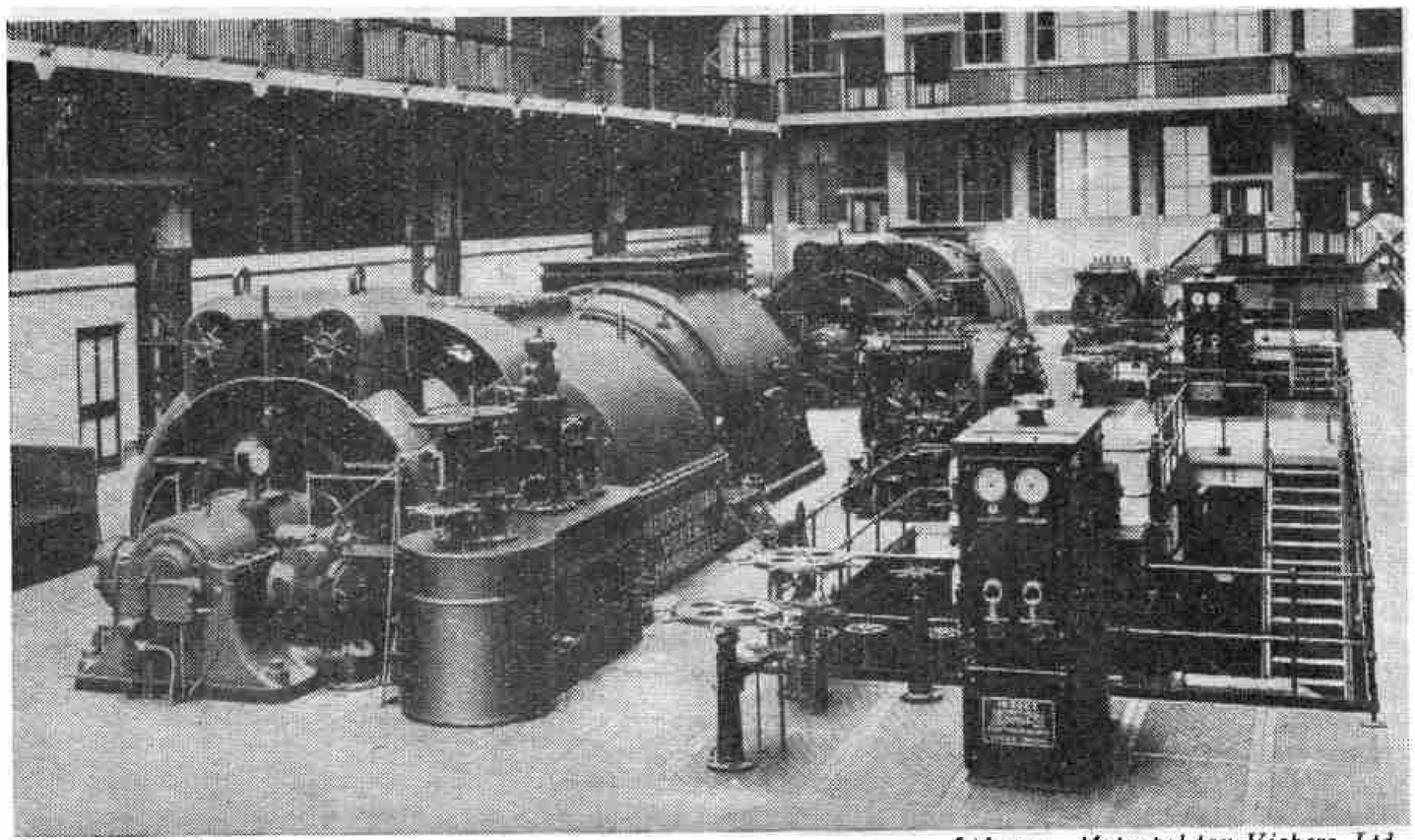

Photo courtesy [*Messrs. Metropolitan-Vickers Ltd.*

Turbo-Generators at a Typical Power Station

Alternating Current

We have already said that alternating current is generated at stations supplying very large areas. This current is generated at pressures of from 2,000 volts upwards. The highest pressure at present employed in this country is about 11,000 volts, but in the United States and in other countries where current has to be transmitted very long distances pressures more than ten times as great are in regular use. Pressures such as this are, of course, very much too high for lamps or motors, and the object of using them is to secure economy in transmitting current through very long cables.

Electrical power is measured in watts. In the case of continuous current the number of watts is obtained by multiplying together the pressure or voltage of the current and its rate of flow or amperage. Therefore, so long as the product of voltage and amperage remains the same, it makes no difference so far as electrical power is concerned whether the current is of low voltage and high amperage or high voltage and low amperage.

In transmitting a current through a long cable a considerable amount of loss occurs through the heating of the cable. This heating is due to the current flow, not to the pressure, and therefore the heavier the current the greater the loss. From this it will be seen that by decreasing the current flow and increasing the pressure by a corresponding amount, the electrical power will remain the same, yet at the same time the loss in transmission will be greatly reduced. It also follows that the use of current at high pressure and low amperage allows of the use of cables of smaller cross-section, and thus a great saving in copper is effected.

In the case of alternating current the calculation of the watts is not quite so simple, but the same principle holds good.

Work of Transformers

Alternating current at pressures of from 2,000 to about 11,000 volts is produced without any difficulty direct from the generators, but where pressures of 100,000 volts and upwards are necessary, direct production is not practicable owing to the great liability of the insulation to break down. In such cases the alternating current is generated at a moderate pressure and raised to the required pressure by means of transformers.

The principle of the transformer was discovered by Faraday in the course of his long series of electrical experiments. He wound upon an iron ring two insulated coils of wire, as shown in the accompanying diagram. Coil A was connected to a battery and Coil B to a galvanometer. When the current was switched on or off in Coil A secondary currents were generated in Coil B. Similarly, if Coil B was used as the primary, then secondary currents were generated in Coil A.

In all transformers the electro-motive forces set up in the secondary coil are nearly proportionate to the relative number of turns of wire in the two coils. If the primary coil has 100 turns and the secondary coil 2,500 turns, then the electromotive force in the secondary circuit will be nearly 25 times as great as that used in the primary circuit. A transformer wound in this manner thus raises or steps-up the voltage of the current supplied to it, and it is called a "step-up" transformer. By reversing the arrangement and having more turns of wire on the primary than on the secondary, we are able to lower the voltage of the original current, and a transformer that does this is called a "step-down" transformer.

Transformers thus enable us to raise or lower the voltage of an alternating current as required, but it should be clearly borne in mind that this does not alter the total power of the current. If the voltage is increased the amperage is correspondingly reduced, and *vice versa*, so that the power of the current is not changed, except for certain inevitable losses of energy that occur in the transformer itself.

The step-down transformer plays an important part in reducing the high transmission voltage of an alternating current to a voltage suitable for industrial and

(*Continued on page* 270

V. STAINLESS STEEL

THE most outstanding feature in the production of special steels during recent times is the discovery and development of stainless steel. The liability to rust in the case of ordinary steel articles is a very serious matter, and the general corrosion in steel structures and articles is always the cause of much trouble and expense. For many years scientists have endeavoured to solve the problem of steel corrosion, the solution of which has now been discovered to be that if the metal chromium is alloyed with steel, the steel becomes immune from many of the more important corroding influences.

With this article we conclude the series that has dealt with the story of iron and steel, considered as raw materials. As space permits we shall print other articles under this heading dealing with the further processes involved in the manufacture of rails, armour-plate, big guns and similar articles. Thereafter we shall tell the story of other minerals, such as coal, copper, aluminium, gold, silver, etc., and we can promise many interesting features under these headings.

The Effect of Chromium

By adding from 12 to 14 per cent. of chromium to steel when it is in the melting furnace, a perfectly uniform steel is prepared with some characteristics so different from those of ordinary steel that it might indeed be considered to be a different metal. For instance, we may take drillings of ordinary steel and drillings of stainless steel, and placing them in separate glass vessels, pour nitric acid on them. The ordinary steel drillings dissolve with the production of great heat and dense brown fumes, whereas the stainless steel drillings are not affected. Nitric acid is one of the strongest oxidising agents known, and such an experiment as this shows what an enormous advance has been made in solving the problem of preventing corrosion.

There is only one drawback to this great development in metallurgy—unfortunately the metal chromium does not exist in sufficient abundance for 12 to 14 per cent. to be added to all the steel made. Nevertheless there are sufficient supplies of the chromium ores in existence to make the process practicable for the production of non-rusting steel for special purposes.

Although stainless steel is one of the special steels that have been newly developed, it is already less than half the price of the best high-speed tool steels, which fact brings it at once into a practicable field of application.

Twenty Million Stainless Knives a Year

The application of stainless steel to cutlery is, of course, known to everybody, but it will probably surprise most people to know that already from 12,000,000 to 20,000,000 stainless knives are produced in Sheffield every year! So satisfactory are the stainless properties of this cutlery that one Sheffield cutlery firm, who make something like a million stainless knives a year, had only one complaint last year of a knife staining. Such a record is a tribute not only to the excellence of the stainless steel, but also to the skill and care of the cutlery manufacturers.

While we are on the subject of stainless cutlery it may be useful to contradict one or two strange ideas that are abroad in regard to such cutlery. We frequently hear it said that stainless knives will not cut, that they must not be sharpened, and that their stainless properties are only a surface effect. All these ideas are entirely wrong. Stainless knives, like any other knives must be sharpened if the cutting edge is to be maintained, and there need be no hesitation about sharpening them properly on a steel. The scratches produced by sharpening will not in any way affect a knife's stainless properties. In producing the knife the steel is hardened and tempered, and exactly the same temper is given to the blade as in the case of ordinary cutlery. A stainless knife, therefore, is fully equal in temper and cutting properties to ordinary cutlery.

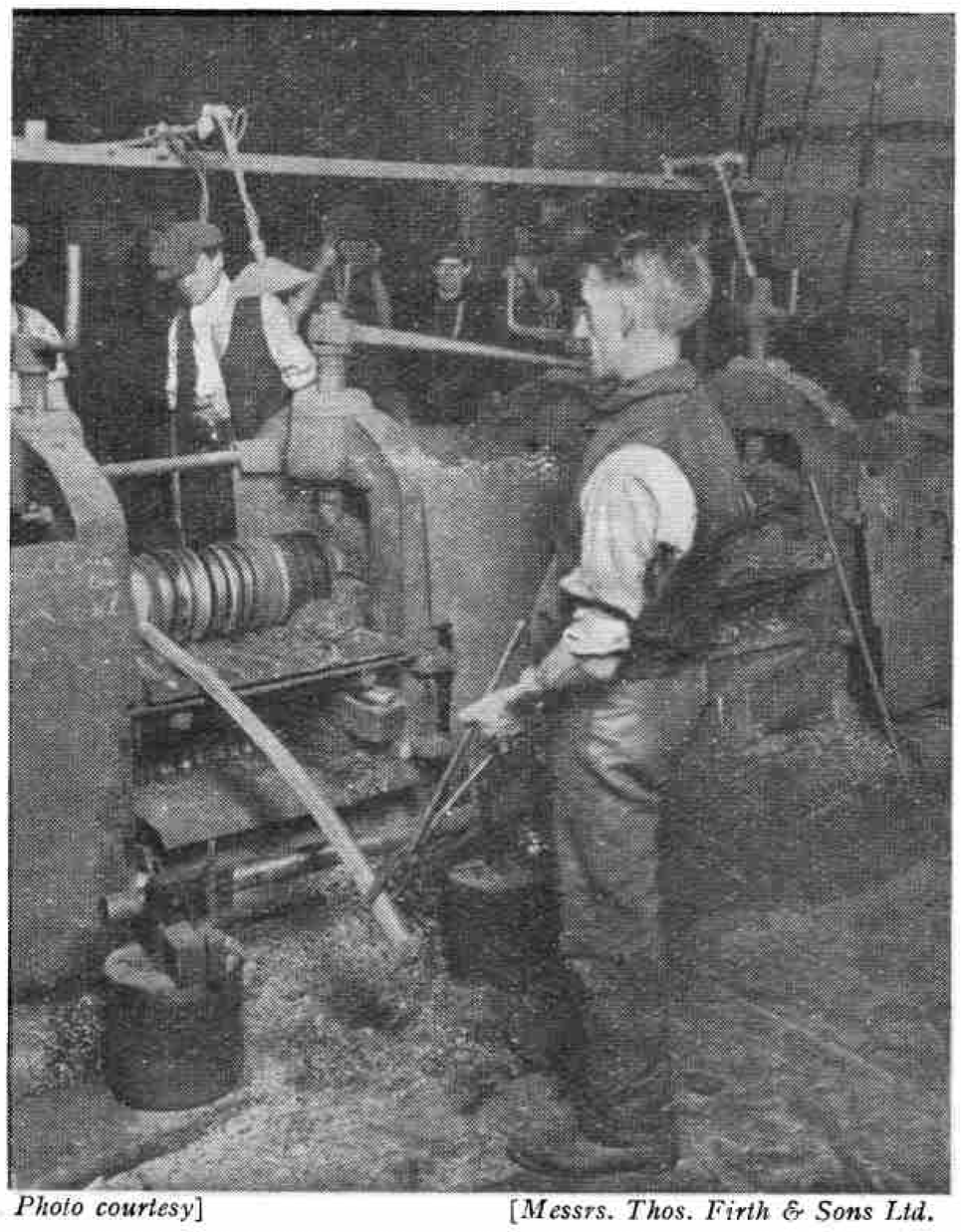

Photo courtesy] [*Messrs. Thos. Firth & Sons Ltd.*

Rolling Stainless Steel Bars for Turbine Blades

Strength and Toughness

The great success of stainless knives has caused metallurgists to consider the application of the steel to many other purposes, particularly in the realm of engineering, and Messrs. Thos. Firth & Sons Ltd., the original makers of the steel, began some years ago to develop stainless steel for such work.

Stainless steel is now being used in large quantities. The metal is obtained in such a condition that it can be machined easily and does not require a further hardening and tempering before being put into service. Such steel has a strength and toughness equal to special alloy steels such as are used for back axles and transmission shafts in motor cars, and therefore it will be appreciated that such characteristics, accompanied by non-rusting properties, cannot fail to ensure steady expansion of its use. Further modifications of the steel have also been introduced, and stainless steel is now available in the form of sheet, wire, tubes and so on—indeed in all forms in which ordinary steel is available.

Resistance to Corrosion

It is not claimed that stainless steel will resist corrosion of every kind, but neither will even such metals as gold and platinum, for the chemist, if he wishes, can dissolve even the latter. But the addition of chromium to the steel so increases its resistance to the corroding influences with which it is likely to be brought into contact that the metal may really be considered rustless. The entirely satisfactory service given by millions of stainless steel knives clearly proves that these knives are impervious to the effects produced on knives of ordinary steel by the juices of the orange, lemon, apple, tomato, various sauces, etc.

The most common corrosive

influences, weathering agents, have little effect on stainless steel. Samples have been exposed to the weather, wet and dry, frost and snow, for many months, and at the end of the time they have been perfectly bright and unaffected in any way. Samples have been placed in streams, and after twelve months have still maintained their original brightness. Knives have been lost for many months in drains, and after washing have been found still bright and unoxidised. The atmosphere of large towns has a superficial effect on stainless steel, but this is due to the products of combustion and industry in the atmosphere, and surface effects of this kind are easily removed. A pump shaft of stainless steel which had been in service in the water of the River Don, a notoriously dirty river, was found to be covered with the usual accumulations from the water, but when the deposit was cleaned off the steel was found to be quite bright and with no sign of corrosion. It has also been found that total immersion in sea water does not affect stainless steel.

Photo courtesy] [*Messrs. Thos. Firth & Sons Ltd.*

Moulding Small Castings of Stainless Steel

In addition to stainless steel there is another material known as stainless iron. The difference between stainless steel and stainless iron lies in the fact that the iron contains a lower percentage of carbon, and in reality it is not iron at all, but mild steel.

Optical Uses

The capability of stainless steel of being worked up to a geometrically perfect surface having a perfect polish renders it eminently suitable for use as mirrors of various kinds. For this purpose it is superior to silvered glass, not only on account of its high reflecting efficiency, but also because of the absence of "multiple" reflection which glass mirrors give owing to reflection from both front and rear surfaces of the glass. In addition the surface keeps its reflecting properties indefinitely, and does not suffer from deposited moisture as glass readily does, while, of course, the question of loosening or destruction of the "silvering" does not arise. The steel is readily formed and finished either as a plane surface or as a concave or convex surface, and lends itself much better than glass to grinding and polishing operations. For oblique mirrors, inverting mirrors, right-angle mirrors and similar combinations such as are found necessary in optical appliances, stainless steel is finding an extended use.

Stainless steel is a direct result of the application of science to industry, and it is very gratifying that it should have been an English discovery. Its manufacture is being conducted under the best technical conditions and, as the steel rightly merits, the demand for it is increasing from month to month.

New Process of Iron Making

Serious Rival to Blast Furnace

The announcement of a new process by which pig iron may be produced at a low temperature has aroused a great deal of interest.

The inventor of the process is Mr. John W. Hornsey, an American consulting engineer, of English descent. Some years ago Mr. Hornsey became interested in the problem of low-temperature production of iron, and by 1922 had evolved a practical scheme. In that year, while on holiday in this country, he submitted his plans to certain British ironmasters, who were so greatly impressed that they built special works at Sheepbridge, near Sheffield, for demonstration purposes. Work commenced in March 1922, and the first operation of the plant was carried out in January of last year.

In this process the iron is produced in a rotary kiln something like that used in the cement industry. Low-grade slack is used instead of the expensive metallurgical coke required for the blast furnace, and no limestone or other flux is needed. The process is said to result in a saving, as compared with the blast-furnace process, of £1 per ton of iron produced. Other advantages of the process are that, as the plant is not subjected to great heat, the cost of repairs and renewals is less than in the blast furnace, and that, unlike the blast furnace, the kiln plant can be stopped and started as required, the cost of restarting being only the price of two or three hours' fuel. Further, the process lends itself to the use of English low-grade ores without any admixture of high-grade qualities.

In regard to quality, no difficulty has been found in making iron sufficiently low in sulphur and phosphorus for all practical purposes. In the blast-furnace process the various contents of the furnace are melted together and the iron is tapped off. The reduction of the iron oxide, however, takes place at a temperature greatly below the melting point of the iron, and thus a useless expenditure of heat is involved. In the new process the iron is not melted at all, and in addition to the saving in heat there is the advantage that the iron does not absorb impurities from the other materials in the ore, as is the case when the iron and these materials are all molten together.

Finally, the iron produced by the low-temperature process, even when low-grade iron is used, has given the most satisfactory results when used in steel-making, the steel being of very high quality.

A Bicycle for a Snap

An interesting photographic competition for purchasers of Messrs. Butcher's "Little Nipper" Cameras is announced on page 266. The first prize is a B.S.A. Bicycle, the second a Tennis Racket or Cricket Bat and the third a Silver Watch. In addition there are 100 consolation prizes. Competitors must be under the age of 17 and the photographs must be taken with a "Little Nipper." There are no other restrictions, and each competitor may enter as many pictures as he likes. Those who intend to enter for this competition should lose no time, as the closing date is the 30th of this month.

New Meccano Part

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Round the World

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Further Adventures in Meccanoland

BRAINS AND INGENUITY IN THE CHAMPIONSHIP CONTEST

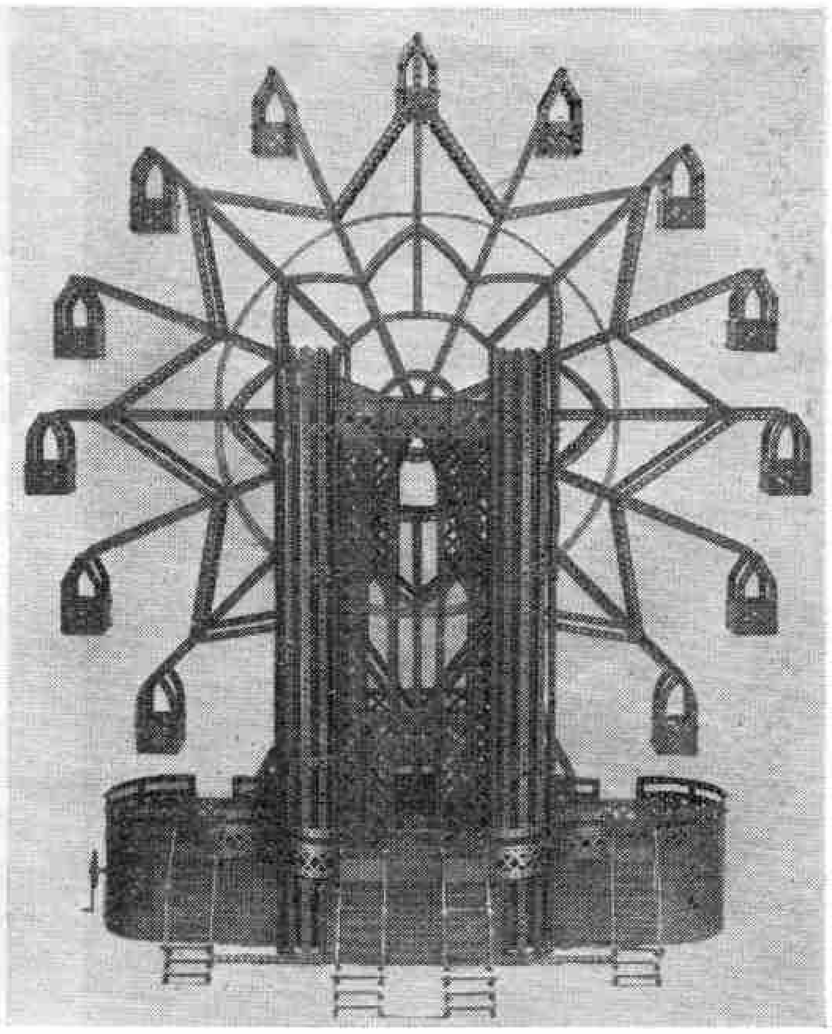
by "Spanner"

I HAVE just returned to London after a visit to the north of England, and on my way up I had an interesting experience about which I want to tell you boys. Before I started I made up my mind to pay a visit to the Meccano headquarters in order to see some of the new models in which I was specially interested, and I had written to Mr. Hornby telling him that I should arrive on a certain day.

When I reached the offices I was told that Mr. Hornby was in the model room, and I was taken over to see him. I found him with two other gentlemen, absorbed in the study of a vast number of photographs and drawings which, they told me, were the entries in the Meccano Championship Competition.

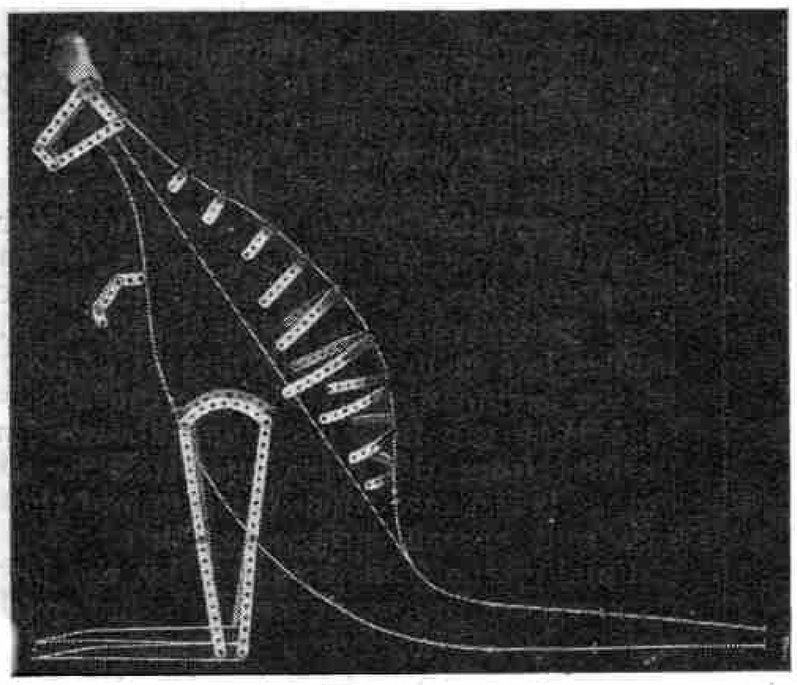
The adjudication had almost been completed at the time of my arrival, and Mr. Hornby told me what a difficult but fascinating task it had been.

"The keenest interest has been taken in this contest," he said, "and I have been amazed by the number of entries and by the ingenuity and inventiveness shown by the competitors. Another feature that is very gratifying to me is the increased interest taken in Meccano by boys in remote parts of the world."



Big Wheel

(Entered by H. Woodman, Melksham, Wilts.)



Kangaroo

(Entered by E. Hayward, Perth, West Australia)

Thousands of Entries

Mr. Hornby asked me if I would care to look through some of the entries, and you may be sure that I jumped at the opportunity. In fact, I told him that nothing would give me greater pleasure than to examine every single entry as he had done, and I observed an amused twinkle in his eye as he told me to "go ahead."

It was with great enthusiasm that I attacked the first classified section, which happened to be Section B containing all the entries from Great Britain, but at the end of two hours I found I had scarcely made any impression on the mass of entries! It became evident that either I should have to devote as many weeks to the examination as the judges had already done, or I should have to go through the entries much more quickly. I decided on the latter course, and made a selection of those entries from all countries that seemed to me to be worthy of attention and comment, and I hope that what I found of interest in them will also prove of interest to readers of the "*M.M.*"

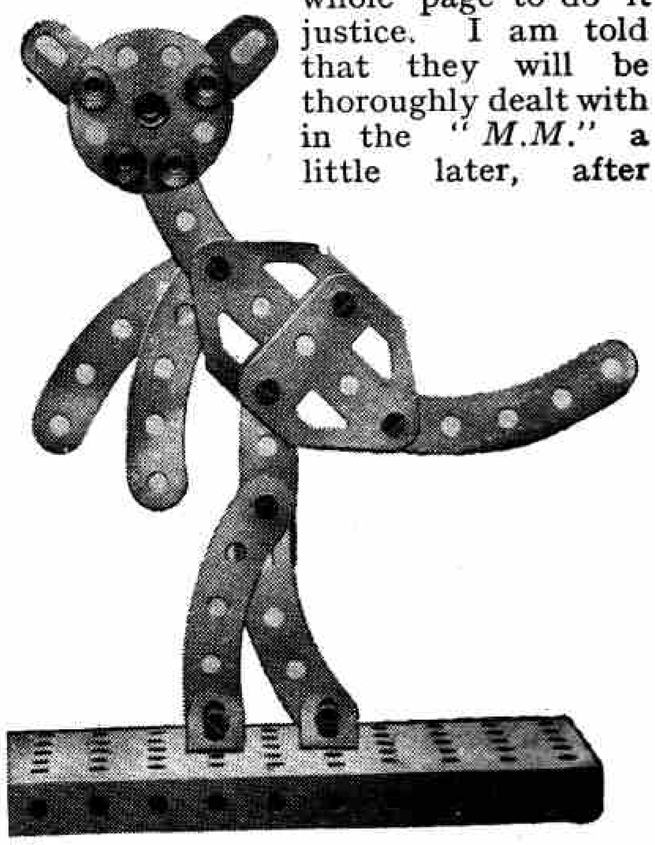
A Million Friends

It seemed to me to be a wonderful thing to have the work of all these vigorous young brains brought together in this way. There were entries—thousands of them—from every country, each entrant striving to create something new and to invent something worthy of commendation, and which would give an added pleasure to dwellers in the great Meccano World.

A large number of the competitors had sent photographs of themselves, either standing by their models or separately, and as I looked at their smiling faces I envied Mr. Hornby his million boy friends. There were smiles and greetings in all languages, and I saw that most of the boys were wearing the little triangular Meccano Guild Badge on their coats. This made me think what a glorious meeting we should have if only we could all get together! As a matter of fact, the competitors in this great Championship Contest had really come together in spirit at that moment, and there they were all smiling at each other and at me. I just yearned to be able to take each one in a quiet corner and talk over his model with him and discuss his difficulties.

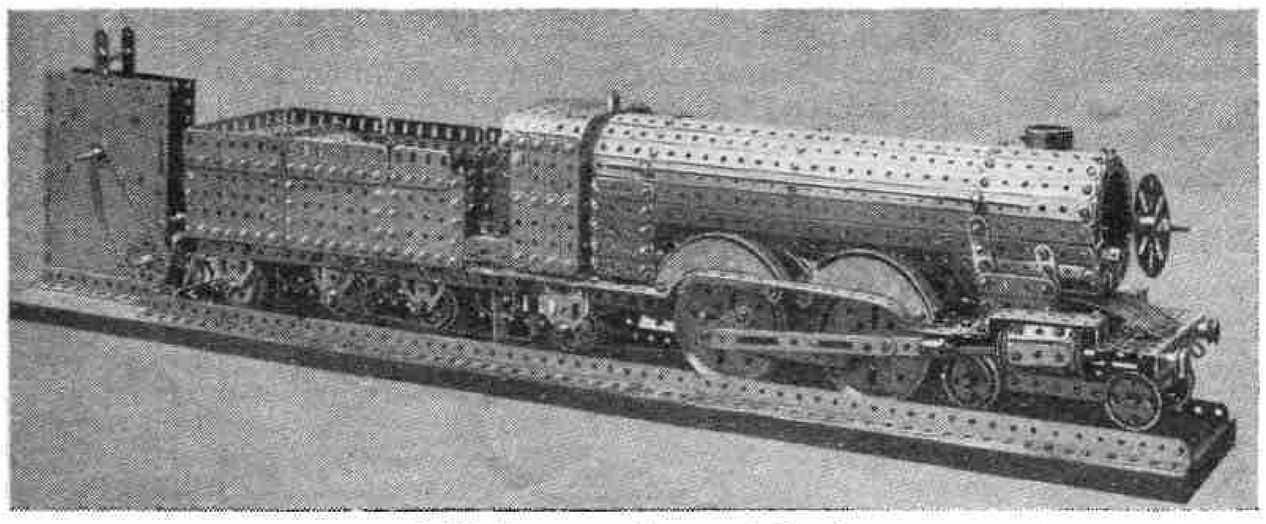
Better Photographs Wanted

I examined the entries that had secured the Championship Cups, but you will all realise that I cannot describe these, for each one would require a whole page to do it justice. I am told that they will be thoroughly dealt with in the "*M.M.*" a little later, after models have been built up from the details and photographs submitted by the entrants. I must say how excellent they all were, however, and how much I admired the ingenuity and inventiveness shown in them. My purpose in this article is rather to deal with Competition entries as a whole, and to tell you of one or two features of them that seemed to be both interesting and curious.



Felix

(Entered by K. G. Boggis, Beccles)

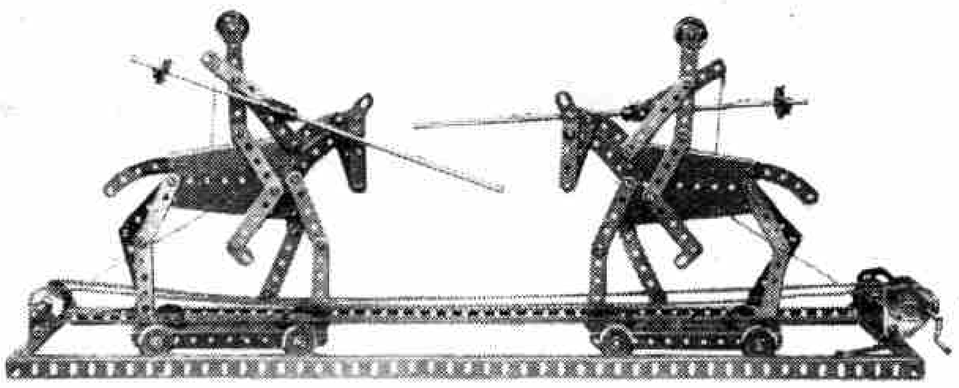


G.W. Locomotive and Tender

(Entered by W. Kendrick, Warrington)

Let me here remark on some of the reasons that

entries failed to attract the attention of the judges. Quite a number of competitors had sent in what were undoubtedly interesting models, but the photographs they sent did them anything but justice. In several instances the models in the photographs measured less than one inch



Knights Jousting

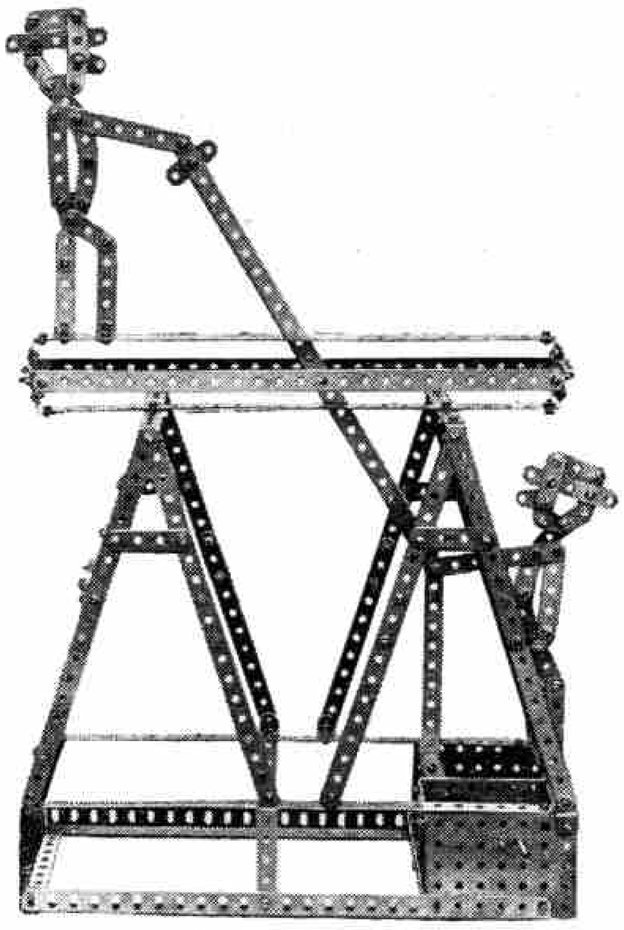
(Entered by R. Rousseau, Le Mans, Sarthe)

in diameter! You may imagine that it was quite impossible for the judges to form any idea of the details of construction of the models in photographs so small. Other photographs had been sent in "un-fixed," and by the time they reached the judges they had blackened all over and the image had disappeared completely. In such instances the boys had to be written to for new photographs and further particulars, all of which added to the delays and difficulties of adjudication. A perfectly clear photograph or drawing helps the judges considerably, and naturally increases the competitor's chances of gaining honours.

A Scale Model Locomotive

I observed that quite a number of competitors had designed very excellent models of locomotives, and much ingenuity had been shown in adapting Meccano parts to this somewhat trying type of structure. The drawback to models of this kind, of course, is that, on account of their weight and size, they cannot be used on the ordinary toy railway track. Although many boys may get an immense amount of pleasure in designing and constructing locos, these can never be classed as completely satisfactory Meccano models because they cannot be utilised for real work as in the case of a model of a Crane, Wagon, Clock or Chassis, etc.

For those boys who take an interest in designing locos, I am illustrating a very excellent model, sent in by W. Kendrick, of Warrington. Here the approved lines of loco construction have been followed with remarkable faithfulness, the special feature of the model being that it is on a scale of ½" to the foot. The model is founded on the general principles and construction of this type and is correct in proportion throughout. It is evident that much careful thought has been used in the design of the model, and I recommend my readers to have a shot at a similar construction and endeavour to improve on this fine effort.



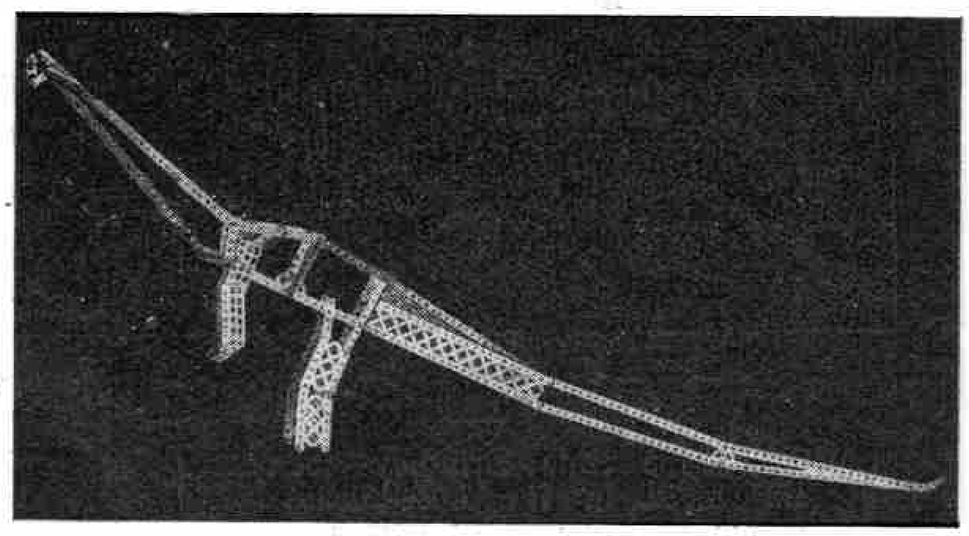
Sawing a Log

(Entered by R. Wijffels, St. Kruis, Zeeland, Holland)

Curved and Straight Lines

I have often thought that my young friends do not make quite sufficient use of the various curved parts that have been added to the Meccano system in recent years. Curved lines are often much more pleasing and artistic than straight lines, especially in constructional — as distinguished from mechanical —models. Thus the new Curved Strips, Architraves, Large Wheel Segments, etc., may often be used with pleasing effect.

I was pleased to notice that some of the competitors had recognised this, and the illustration on the previous page is a good example of what I mean. This Big Wheel was designed by H. Woodman, of Melksham,



Extinct Diplodocus

(Entered by W. Harvey, Thornton Heath)

Wilts., and incidentally, in the letter that accompanied his entry, he made a very happy reference to the many delightful evenings that Meccano had provided. Note the pleasing curves that this competitor has so successfully introduced. This is undoubtedly a good model, but in some of its details I believe it could even now be improved. I should be glad to know that some of my readers have conceived a liking for Mr. Woodman's impressive structure, and that they intend to try and go one better!

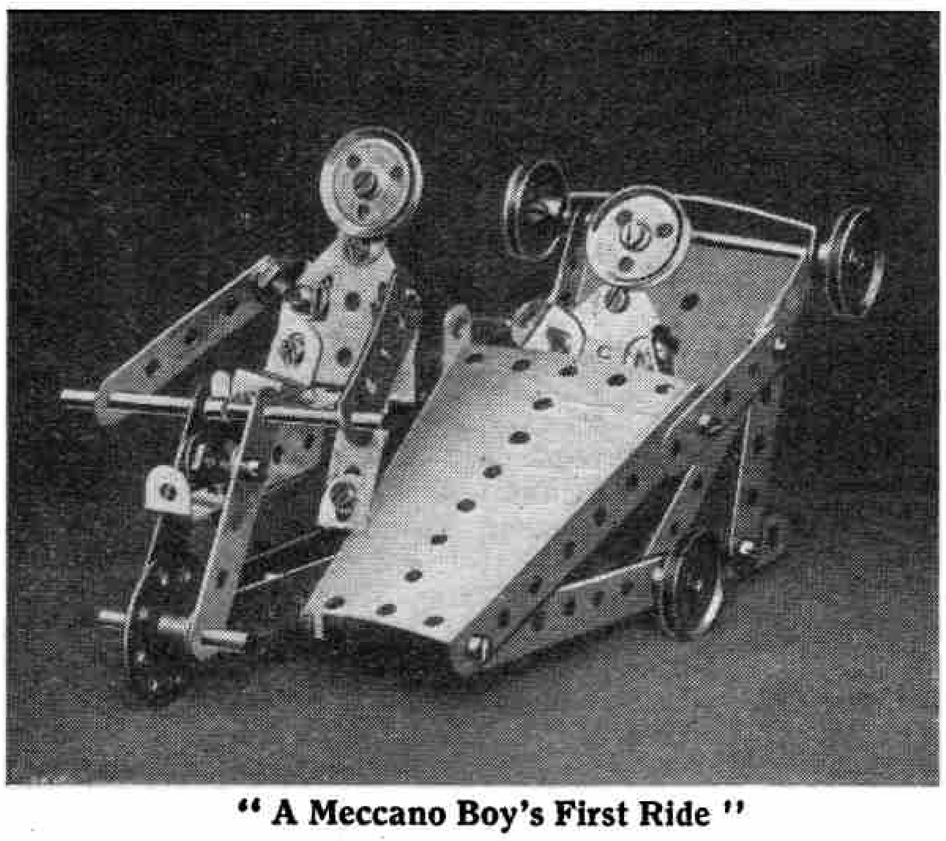
"Felix" and other Humorous Models

I was anxious to see how the younger boys had fared in this competition, and as I scanned the entries I experienced some pleasant thrills and incidentally had one or two unexpected laughs. Here for instance is a model sent in by K. G. Boggis, of Geldeston, which he calls "Felix." He states that Felix can sit down or run and perform all kinds of antics. He certainly cuts a comical figure!

Another humorous effort was that of R. Rousseau, of Le Mans, Sarthe, who sent in a model of jousting knights which he called the "Tournament." Both knights in armour and their fiery steeds are very life-like, and by turning a handle they may be made to tilt at each other in a very realistic manner.

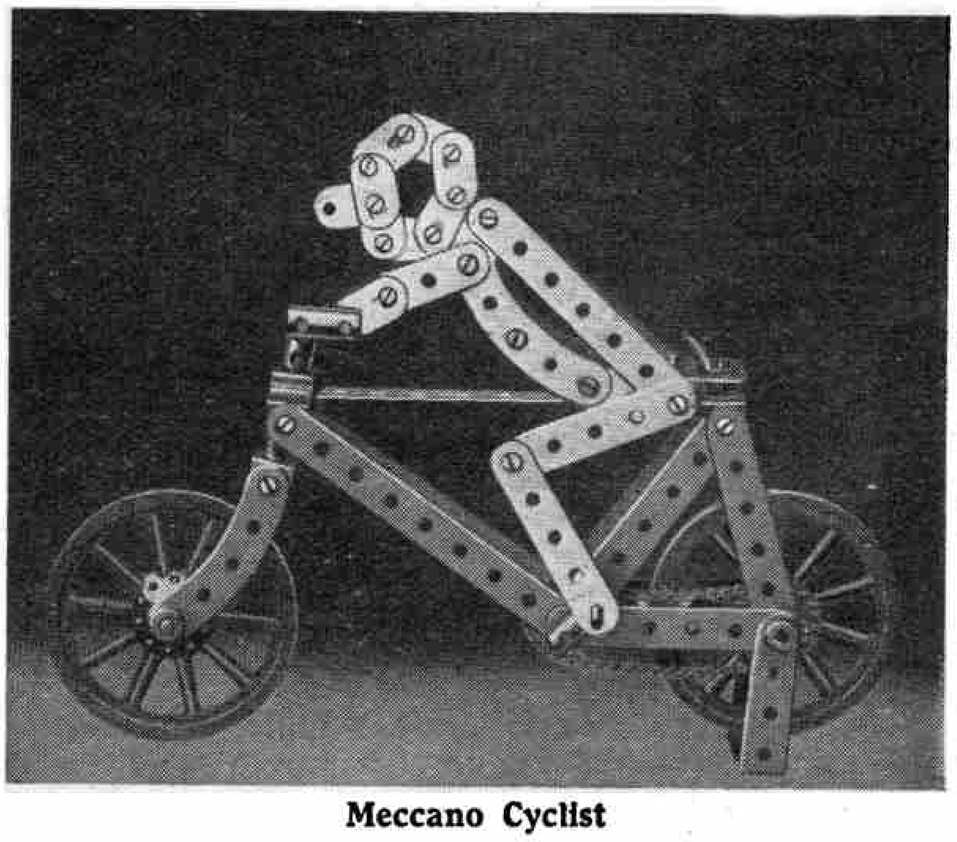
R. Wijffels, of St. Kruis, Zeeland, Holland, demonstrated that he has an

(*Continued on page* 245)



"A Meccano Boy's First Ride"

(Entered by M. Manning, Bristol)



Meccano Cyclist

(Entered by J. Bouchenoir, Drancy, France)

VIII. JAMES BRINDLEY: The First English Canal Engineer

Last month we saw how Brindley, the millwright's apprentice, steadily advanced in his trade, and in spite of the jeers of his fellows gained so much mechanical knowledge as to become his master's trusted servant. He was in great demand in the district where he worked, and it was predicted that he had a great future. In this article is described his first great undertaking, the construction of the Bridgewater Canal.

ABOUT this time Brindley became interested in the possibilities of steam as a source of power. One of Newcomen's engines was proving very successful in drawing water from a coal mine near Wolverhampton, and Brindley made a special journey to examine it. He was greatly struck with it, but he saw at once that it consumed far too much coal, and realised that it could only be an economic success where coal was unusually abundant and cheap.

Effects Economy in Fuel-Consumption

He at once attacked this problem of fuel economy, and in 1756 commenced the erection of an improved engine at Fenton Vivian, in Staffordshire. In this engine he adopted the plan—afterwards tried by Watt—of making the cylinders of wood instead of iron, and he also substituted wood for iron in the chains that worked at the end of the beam. Like Watt, he had to abandon his wooden cylinders, but as an alternative he surrounded the iron cylinders with a wooden case, filling the intervening space with wood ashes. By this means, and by cutting down to the minimum the quantity of water injected for condensation purposes, he succeeded in reducing the waste of steam by nearly half.

The quaint entries in Brindley's note-book regarding this engine show that it gave him a lot of trouble. It took a year to construct, and when it was finished it appears to have taken a great deal to persuade it to work. Brindley's notes are brief but very much to the point. We read: "Bad louk (luck) five days"; then "Bad louk" for three more days. Then matters seem to have improved a little, for we find "Midlin' louk" for some days! From the succeeding entries it is clear that he had a long struggle to get his "engon at woork." He writes: "Engon at woork 3 days," and then there was a stoppage of four days, after which the engine worked for seven days and Brindley was so excited about it that he wrote "Driv-a-Heyd" ("Drive-ahead.") Later, however, more trouble seems to have occurred, and the entries come to a sudden close with the words: "At woork good ordor 3 days." The subsequent career of that "engon" is shrouded in mystery.

During the next few years Brindley built a number of other engines on improved lines, but his work had little influence upon the development of the steam engine, and his mind was already turning to canal construction, in which his remarkable ability found its fullest scope.

Beginning of the Bridgewater Canal

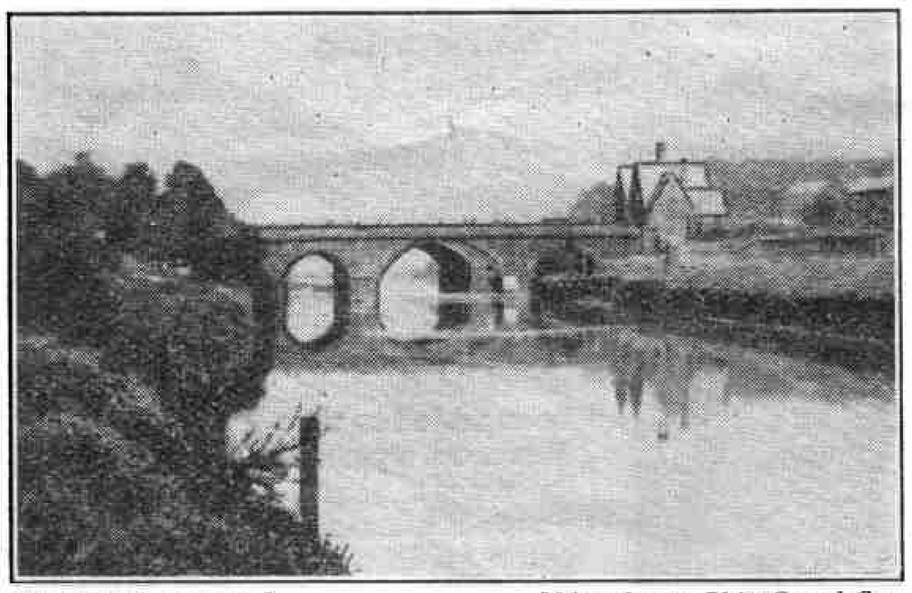
Up to this time very little had been done in England to develop inland waterways, although attempts had been made to open up the navigation of the Mersey and the Irwell from Liverpool to Manchester. Schemes had also been started in Yorkshire to open up the navigation of the Aire and Calder to Leeds and Wakefield, and of the Don from Doncaster to near Sheffield. In 1737 an Act was passed by Parliament to make navigable the Worsley Brook to the point where it joins the River Irwell near Manchester, and a couple of years later another Act was passed for making the Sankey Brook navigable from the Mersey about two miles below Warrington to St. Helens, Gerrard Bridge, and Penny Bridge. In the latter scheme a canal was constructed alongside the brook, and locks were made to adapt the canal to the level of the country through which it passed.

About the same time the Corporation of Liverpool were considering a much more ambitious scheme, consisting of a canal to unite the Trent and the Mersey so as to open up a waterway between Liverpool and Hull. Two surveys were made for this canal, the second one by Brindley at the instance of Earl Gower. This scheme apparently fell through, however, but it was not long before Brindley was engaged on another canal scheme proposed by the Duke of Bridgewater.

The Duke's Scheme

While travelling in France, the Duke of Bridgewater was greatly impressed by the Grand Canal of Languedoc. This important waterway was begun in 1666 and completed in 1681. It crossed the isthmus connecting France and Spain and extended for a distance of nearly 160 miles from the River Garonne at Toulouse to Cette on the Mediterranean, thus providing a waterway from that sea to the Atlantic. After his return to England the Duke settled on his Lancashire estate at Worsley, on the borders of Chat Moss, and the idea occurred to him that it might be possible to cut a canal by which the coal found on his estate could be readily conveyed to Manchester. At that time Manchester, although only a small town, was steadily increasing in size and importance. Owing to the terribly bad state of the roads it was very difficult at times to provide food and coal for the large population, especially in winter when road traffic was almost entirely at a standstill. The Duke became convinced that his idea was sound, and in 1759 he obtained from Parliament powers to cut a canal from Worsley Mill eastward to Salford, and westward to Hollin Ferry on the Mersey.

The Duke's land agent, John Gilbert, knew of Brindley's skill through his brother, Thomas Gilbert, who was at that time agent to Earl Gower. Neither the Duke nor his agent had any practical knowledge of engineering, and Brindley was called in to advise them as to the best method of constructing the canal.



Photograph courtesy [*Manchester Ship Canal Co.*

Brindley's Aqueduct at Barton

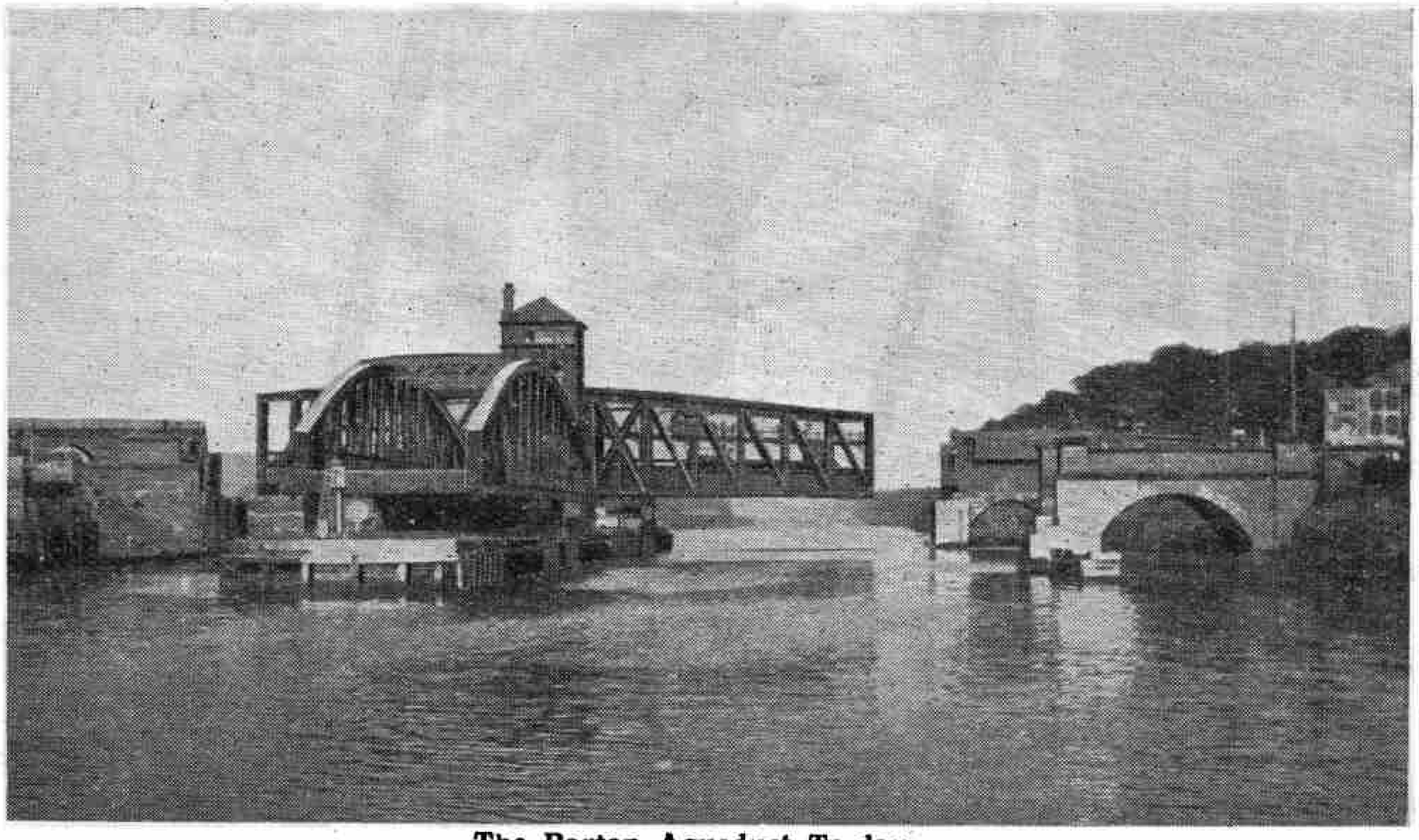
Brindley's Proposal Ridiculed

The original idea had been to carry the canal by means of a series of locks down from the level of the coal mine into the River Irwell, and so up again on the other side to the proposed level. Brindley, however, recommended that the canal should be carried right over the river and maintained at one level throughout. This was a bold proposition involving works that had not been attempted in England before, but Brindley succeeded in convincing the Duke that his scheme was the best for the purpose. It was now necessary to obtain the sanction of Parliament to the proposed new scheme of

operations, and plans were prepared and the application was put in. In the meantime work proceeded on such portions of the canal as could be carried out under the powers already obtained.

The necessary Parliamentary sanction was obtained in 1760, and now the Duke was free to carry his canal over the Irwell near Barton Bridge, about five miles west of Manchester, by means of a series of arches, and he was further authorised to extend a short branch to Longford Bridge near Stretford, the branch to Hollin Ferry being abandoned.

The aqueduct was, of course, the most difficult part of the undertaking. The proposal to carry barges on a bridge over the top of other barges navigating the river below was ridiculed by the general public as the idea of a lunatic. Even the Duke himself was rather uneasy about the project, and he called in another engineer to give his opinion. To the dismay of Brindley, this engineer said the aqueduct scheme was sheer folly, and wound up his report to the Duke with the words: "I have often heard of castles in the air, but never before saw where any of them were to be erected." Brindley was still confident as to the ultimate success of his scheme, however, and finally the Duke authorised him to carry it out.



The Barton Aqueduct To-day

Brindley's Remarkable Ingenuity

The Barton aqueduct built by Brindley was about 200 yards in length and 12 yards in width, the middle portion being supported by a bridge of three arches. It carried the canal over the river at a height of 39 ft., and so allowed the largest barges to pass beneath without lowering their masts. The canal passed over the arches in a channel carefully "puddled," that is, lined with a carefully-prepared mixture of well-tempered clay and sand, through which the water could not penetrate.

Brindley's remarkable ingenuity and resource are well illustrated by the way in which he dealt with the streams that flowed across the course of the canal. It was one of his fixed principles never to allow a stream or river to flow into a canal except for the purpose of supply, because he realised that in times of flood the rush of water into the canal would be dangerous to navigation. The plan he adopted in dealing with the River Medlock is an excellent example of his methods. He constructed a weir 366 yards in circumference, over which the river flowed into a well, from which it was conveyed along a subterranean passage into the River Irwell, which is close at hand.

An Underground Canal

In addition to cutting the canal itself, Brindley excavated a large basin at Worsley Mill, the starting point of the canal. The idea of this was to provide accommodation for a number of barges, and thus serve as a head for the navigation. He also cut a subterranean channel from the basin to connect the chief workings of the mine, so that the coal could be readily transferred in boats to the place of sale. In Brindley's time this underground canal was about a mile in length, but later it was enlarged until it extended for nearly 40 miles in all directions. The tunnel was arched with brickwork where it passed through coal or earth, but in passing through solid rock it was simply hewn out. The barges when loaded were drawn along by means of staples fixed in the sides of the tunnel, but when empty, and therefore higher in the water, they were so close to the roof that it was necessary for the bargemen to lie on their backs and propel the boats by pushing with their feet against the roof. This method was known as "legging."

The canal was successfully completed, and on 17th July, 1761, the first boatload of the Duke's coal passed over the Barton aqueduct on its way to Manchester.

The result of Brindley's "castle in the air" was that the people of Manchester received regular supplies of coal at a much cheaper rate than ever before. For a long time the aqueduct remained the wonder of the neighbourhood, crowds of people coming daily from all parts to see it.

Brindley in London

The canal between Worsley and Manchester had opened up a regular supply of coal, but there remained the difficulty of transporting the raw materials of trade from Liverpool to Manchester. The Duke of Bridgewater was determined to overcome this difficulty, and in less than two months from the opening of the Worsley canal Brindley was engaged in a survey for a proposed canal to join it with the Mersey near Runcorn, from where there was a natural tideway to Liverpool.

At the same time the Duke made arrangements to present a Bill before Parliament, and early in 1762 Brindley went to London as chief witness before a Parliamentary Committee. He was naturally a very thrifty man, spending as little as possible on clothes, but on this occasion he apparently thought it necessary to be well dressed. His note-books tell us that he spent one guinea—an entire week's pay—on a pair of new breeches, two guineas on a coat and waistcoat of broadcloth, and six shillings on a pair of new shoes!

It was during this stay in London that Brindley paid his first and last visit to a theatre. His friend, Gilbert, the Duke's agent, persuaded him to go to see the famous actor Garrick in the play of "*Richard III.*" but the result was unfortunate. The play excited Brindley so much and so completely disturbed his ideas that he was unable to do any business at all for some days! He declared that nothing should ever tempt him again to enter a theatre, and he kept steadfastly to his resolution.

NEXT MONTH:—

THE GRAND TRUNK CANAL

Further Adventures in Meccanoland—

(*Continued from page* 243)

eye for the grotesque as well as the humorous by entering his model of the "Log Sawers." Very complete instructions were attached to the entry, and I am quite sure that the model works in a most realistic manner.

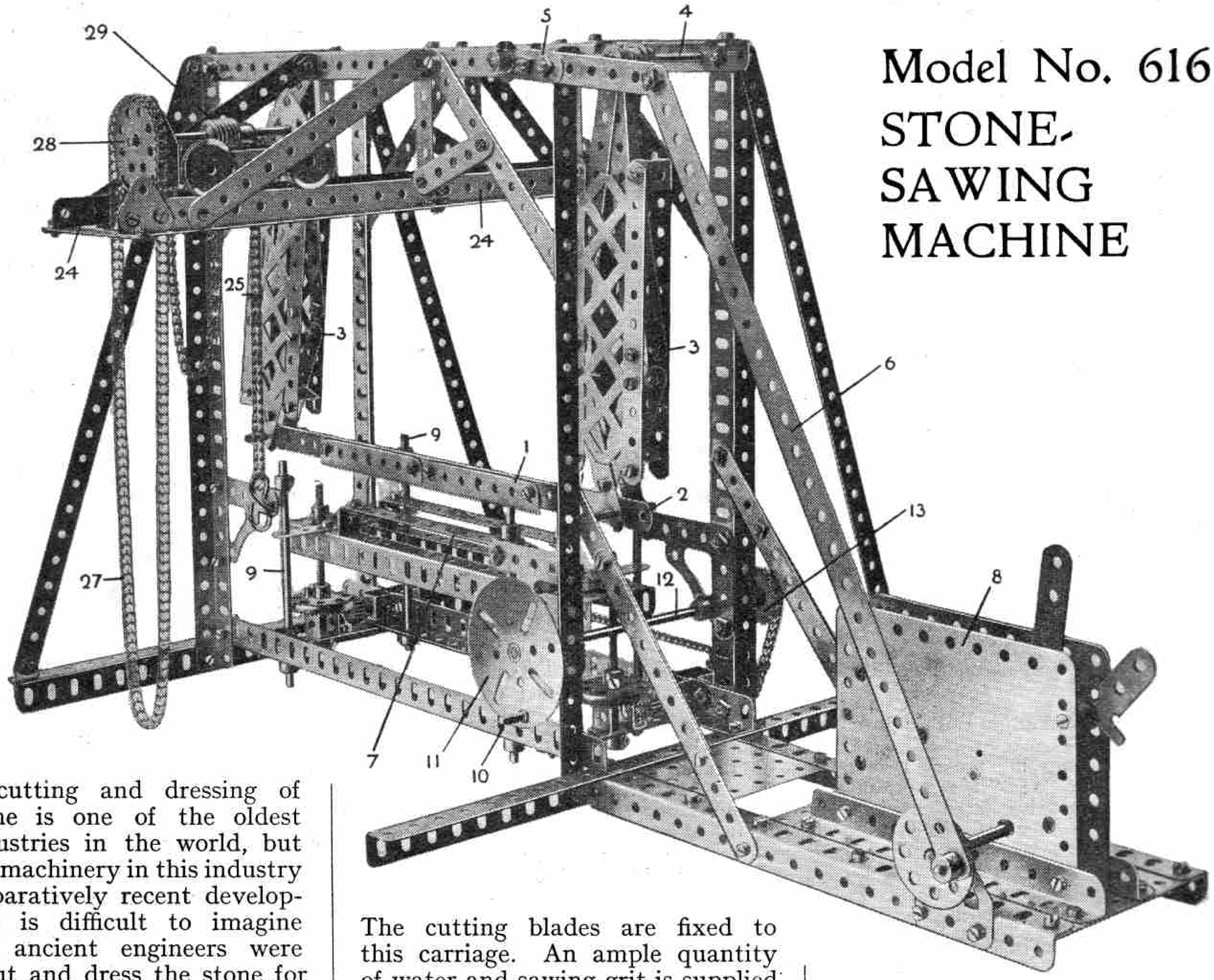
A very realistic model of a Kangaroo was submitted by Eric Hayward, of Perth, Western Australia. Eric calls his model a "Dinkum Aussie," which certainly sounds a good description of this interesting animal—a purely Australian product I believe!

An interesting Meccano "Cyclist," was sent in by Jack Bouchenoir, of Drancy, France; "A Meccano Boy's First Ride" by M. Manning, of Bristol, and "Diplodocus" by Wallace Harvey, of Thornton Heath. There were entries of a similar kind from France, Italy and Spain—indeed almost every country in the world was represented in this class of model, all of them showing a lively imagination and a keen sense of humour.

There is ample evidence here that, apart from the purely mechanical and engineering side of the Meccano hobby, the regular parts of the system may be cleverly used in designing all kinds of novel and unexpected objects. I and my young friends must certainly try our hands at this kind of thing, and the Editor tells me that he will encourage the suggestion by a special competition later in the year.

(*To be continued*)

A NEW MECCANO MODEL



Model No. 616 STONE-SAWING MACHINE

THE cutting and dressing of stone is one of the oldest industries in the world, but the use of machinery in this industry is a comparatively recent development. It is difficult to imagine how the ancient engineers were able to cut and dress the stone for their great buildings and monuments. Indeed, this subject presents many interesting problems, and some of the achievements of the ancient craftsmen are remarkable. Some day we hope to publish a series of articles on Ancient Engineering, when the subject of stone-cutting and stone-dressing in early days will be dealt with in greater detail.

Frame Saws

In modern stone-yards the most important work done by machinery is the actual cutting or sawing of the stone, and for this purpose two main types of saws are used. These are the Diamond Saw and Frame Saw.

The new Meccano model illustrated on this page demonstrates the working of the frame type of saw. This consists of an upright frame supporting a swinging carriage, which is given an oscillating motion from a driving crankshaft. The cutting blades are fixed to this carriage. An ample quantity of water and sawing grit is supplied to the blades, and by driving this grit backward and forward the blades cut their way into the stone.

Diamond Saws

The diamond saw is an entirely different machine, and is of more recent origin.* It operates by means of a circular blade consisting of a steel disc having diamonds mounted in sockets on its periphery. The diamond saw cuts very much faster than the frame saw, and this gives it great commercial value where large output is required.

For some purposes the steel disc and its diamonds are replaced by a wheel having a steel centre and a rim of carborundum. The carborundum wheel gives a very smooth cut with sharp edges, and is largely used in working marble. It takes more power, however, and its cutting rate is slower. In the case of very soft stone—such as Bath stone, for example—a steel-toothed wheel is often used.

Preliminary rough sawing of large blocks of marble or stone is frequently performed in quarries or yards by a wire running over the surface of the stone. This wire cuts in a similar manner to the frame saw, by means of an abrasive such as sand and water.

The Meccano Model

The construction of this model is not difficult to follow from the illustrations, and there is little to be said to supplement them.

The sawing strip (1) consists of two Rack Strips bolted to a 12½" Strip (2) connected by 1" Rods to the ends of the swinging frames (3). One of these is loosely pivoted on one of the Rods carried in the frame, the other being secured by a Crank to the Rod (4). The swinging frames (3) are oscillated

* The first diamond stone saw was made by Geo. Anderson & Co. about 27 years ago. We are indebted for our information on stone saws to Messrs. The Anderson-Grice Co. Ltd., of Carnoustie.

A New Meccano Model—(*continued*)

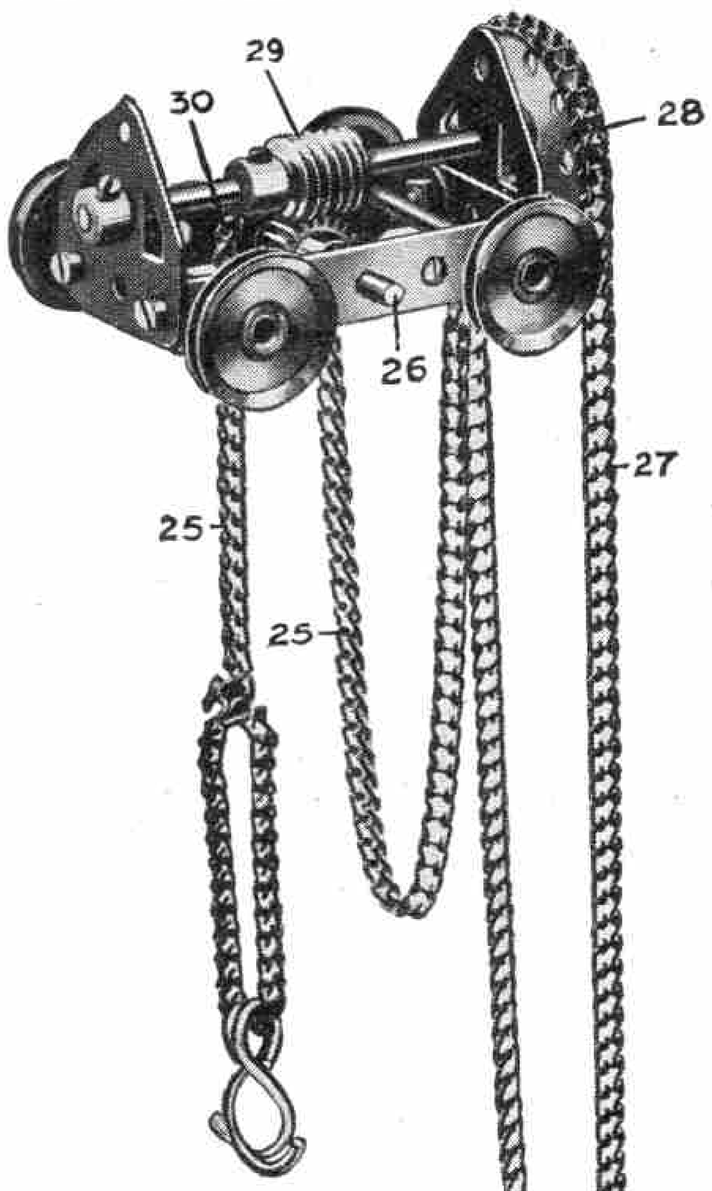


Fig. A

from the Crank (5) and connecting rod (6) driven by the Clockwork Motor (8).

The support frame (7), on which the stone blocks to be sawn are raised and lowered, is guided on the vertical Rods (9) and raised and lowered by the operation of the Threaded Pin (10) forming a handle on the Face Plate (11). This Face Plate is mounted on a Rod (12) carrying a 1″ Sprocket Wheel (13) connected by a chain to another 1″ Sprocket Wheel (14 Fig. B) on a Rod (15). A third 1″ Sprocket (16) on the same rod is coupled to a fourth 1″ Sprocket Wheel (17) at the other end of the machine.

The Rods (15 and 18) carry ½″ Pinions (19) driving Contrate Wheels (20) secured on Screwed Rod (21) and engaging Threaded Cranks (22) secured to the frame (7) by 1½″ Strips (23).

The trolley (Fig. A) runs on gantry rails (24) and the load chain (25) passes over a ¾″ Sprocket Wheel on the Rod (26), to be secured at one end to the trolley frame.

The chain (25) is raised or lowered by the operation of a Sprocket Chain (27) passing over a 1½″ Sprocket Wheel (28). This is mounted on a Rod carrying a Worm (29) which engages a ½″ Pinion on another Rod (26) carrying a Sprocket Wheel (30) over which the load chain (25) passes.

Parts required :

5	of No.	1		12	of No.	35	
19	„ „	2		4	„ „	37	
1	„ „	2A		181	„ „	37A	
11	„ „	3		32	„ „	38	
4	„ „	4		6	„ „	45	
8	„ „	5		1	„ „	47	
2	„ „	6A		5	„ „	48A	
12	„ „	7		3	„ „	53	
4	„ „	8A		2	„ „	57	
2	„ „	9		15	„ „	59	
1	„ „	10		2	„ „	62	
8	„ „	11		2	„ „	62A	
15	„ „	12		2	„ „	76	
1	„ „	14		2	„ „	80A	
1	„ „	15		40″	„ „	94	
5	„ „	15A		1	„ „	95A	
3	„ „	16		1	„ „	96A	
2	„ „	16A		4	„ „	100	
1	„ „	17		4	„ „	108	
2	„ „	18A		1	„ „	109	
4	„ „	22		2	„ „	110	
1	„ „	24		180	„ „	111B	
3	„ „	26		2	„ „	115	
2	„ „	28		4	„ „	125	
1	„ „	32		3	„ „	126A	

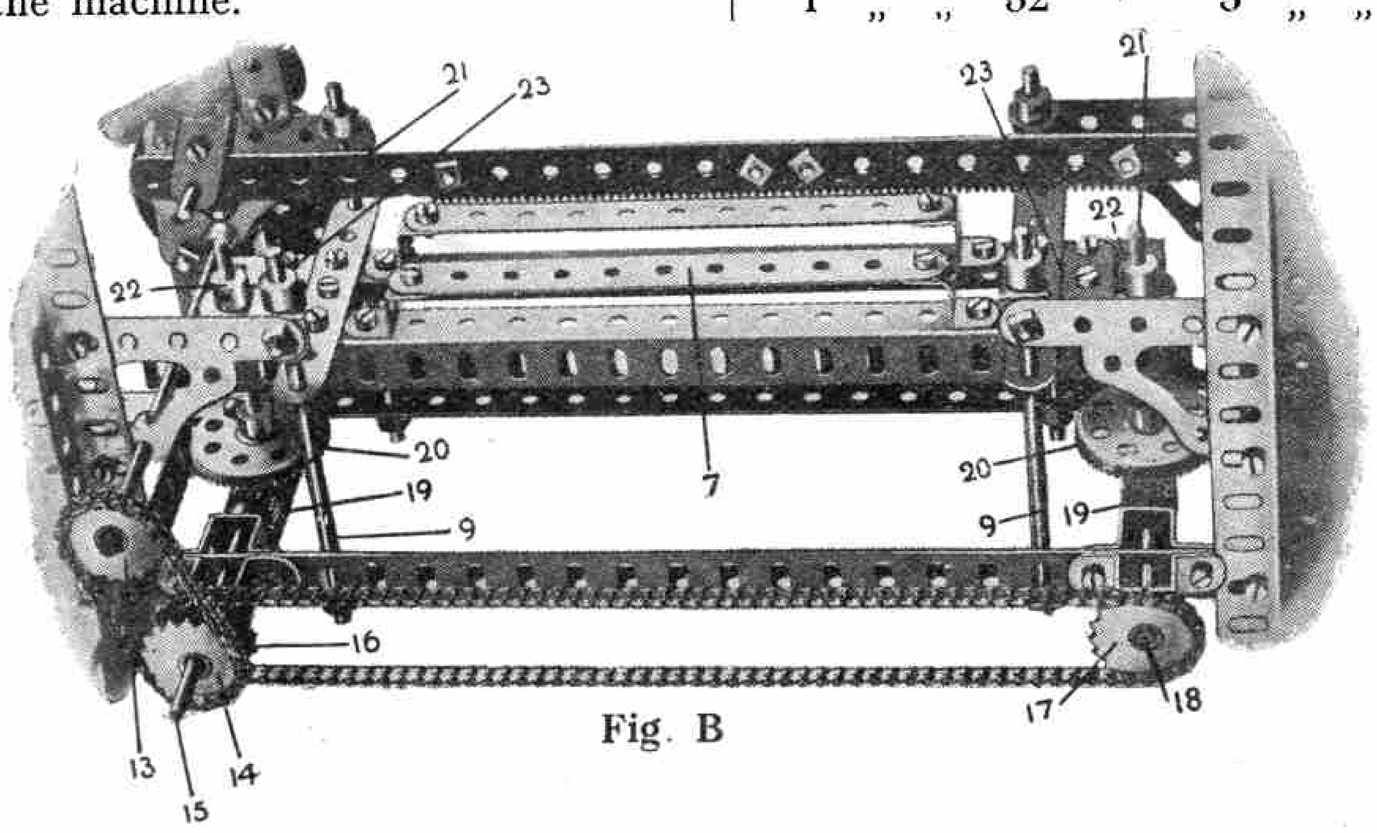


Fig. B

OUR MAIL BAG

In this column the Editor replies to letters from his readers, from whom he is always pleased to hear. He receives hundreds of letters each day, but only those that deal with matters of general interest can be dealt with here.

Correspondents will help the Editor if they will write neatly in ink and on one side of the paper only.

T. Wray (Peckham).—"If six snakes in a circle began to eat each other's tails, how much would be left of each when they had finished eating? I have been trying to solve this problem for many weeks past but have been unlucky." So have we, Thomas; in fact, we have had no luck at all with it!

J. Wadham (Seascale).—We have many girl members of the Meccano Guild and shall be glad to enrol you. We are pleased that you enjoy model-building so much.

D. Armstrong (Sydney, N.S.W.).—You write an excellent letter for one so young. We gave your congratulations to Mr. Hornby, and he asks us to thank you for your nice wishes.

I. M. H. Etherington (Mill Hill).—"I have placed a regular order now with a newsagent for the '*M.M.*,' so I can sleep in peace at night without fear of missing it." That's a fine feeling to have, Ivor, and you share it with about 50,000 other boys. Thanks for your riddle, which is good, and for your kind wishes, which are acceptable.

A. E. Fletcher (Berwick-on-Tweed).—"The '*M.M.*' seems to inspire me with feelings that somehow make Meccano a dearer (not in price) thing to me. When I read about all the fine things that other Meccano boys do I feel that I, too, must do something." Many thanks for all the kind things that your letter contains, and which are much appreciated. We hope that all Meccano boys will wear their Guild Badges when they visit Wembley. They will find there many kindred spirits and thoroughly good fellows.

E. L. West (Taumaranui).—"I live in the heart of the North Island of New Zealand, amidst the wonderful race of Maoris. Around are lonely bush-clad hills." We envy you, Eric! There is no such glorious scenery as you describe near us, but we have lots of nice rainy days! We hope your forecast of a happy Meccano winter is being realised.

G. R. Thomas (Dewsbury).—We greatly appreciate your keenness in recruiting for the Guild, but you make us shudder when you write: "If my chum doesn't join soon I know of a way to make him!" What dreadful tortures are you preparing, G. R.? Surely peaceful persuasion will have its reward.

C. L. Arms (Macclesfield).—Your numerous suggestions are very interesting. We have already given consideration to the publication of photographs of British locos on "cigarette cards," and some day may be able to add these to the attractions of the "*M.M.*," but not at present. Your short story about "Burglar Bill" is very pathetic, and we may be able to find a corner for it some time.

L. R. Stockdale (Thirsk).—We assure you that we share your anxiety to see the "*M.M.*" increase in size, and we will just whisper in your ear that it is already feeling growing pains, so look out for developments before long! We were pleased to hear that you have found the "*Story of Iron and Steel*" useful in your school work.

A. Watson (Melbourne, Australia).—One sentence in your letter appealed to us very much: "Although I am thousands of miles away from you I feel that my Guild membership forms an invisible but real bridge between us." You are quite right, Arthur, the Guild is a world-wide brotherhood of boys, and the Guild President and Secretary are just as much interested in members who live in far-off countries as they are in boys living next door, as one might say.

D. C. Young (Sheffield).—If your father is able to take you to one of the big Sheffield steel works you will be a very lucky boy, and you must write and tell us about your visit. Your story about the Scotsman is a "chestnut" that we heard years ago, even before the story of the Scotsman who went to Woolworth's 6d. Stores and asked for the piano department!

G. Plowright (Lower Benefield).—You seem to have had a real "wamble" at Wembley. We agree that the Palace of Engineering is the most interesting part of the Exhibition, with the Palace of Industry a good second. Editors are supposed to be very serious-minded people, quite above such things as the Amusement Park, but we confess that we also spent a good deal of time there and enjoyed every minute of it!

A. R. Burnicombe (Lincoln).—Many thanks for your good wishes. We are glad to know that you have enjoyed the "*Electricity*" and "*Iron and Steel*" articles so much. We are afraid that your suggestion for a page about pets would not meet with the approval of the majority of our readers. We have an illustration of "Felix the Cat" in this issue.

BUILD YOUR OUTFIT INTO A No. 7

WITH

MECCANO

ACCESSORY OUTFITS

For convenience, Meccano parts are sold in nine Outfits of varying size, numbered 00 to 7. The quality and finish of the parts are of the same high standard throughout the series, but as the Outfits increase in size they contain larger quantities and greater varieties of parts. Each Outfit may be converted into the one next higher by the purchase of an Accessory Outfit. Thus, if a No. 2 is the first Outfit bought, it may be converted into a No. 3 by adding to it a No. 2a. A No. 3a would then convert it into a No. 4, and so on up to No. 7. In this way, no matter with what Outfit you commence, you may build up by degrees to a No. 7 and so be able to make *all* the hundreds of models shown in the Books of Instructions.

PRICE LIST

Complete Outfits

No. 00	.. ..	3/6
No. 0	.. ..	5/-
No. 1	.. ..	8/6
No. 2	.. ..	15/-
No. 3	.. ..	22/6
No. 4	.. ..	40/-
No. 5 (In well-made carton)		55/-
No. 5 (In superior oak cabinet with lock & key)		85/-
No. 6 (In well-made carton)		105/-
No. 6 (In superior oak cabinet with lock & key)		140/-
No. 7 (In superior oak cabinet with lock & key)		370/-

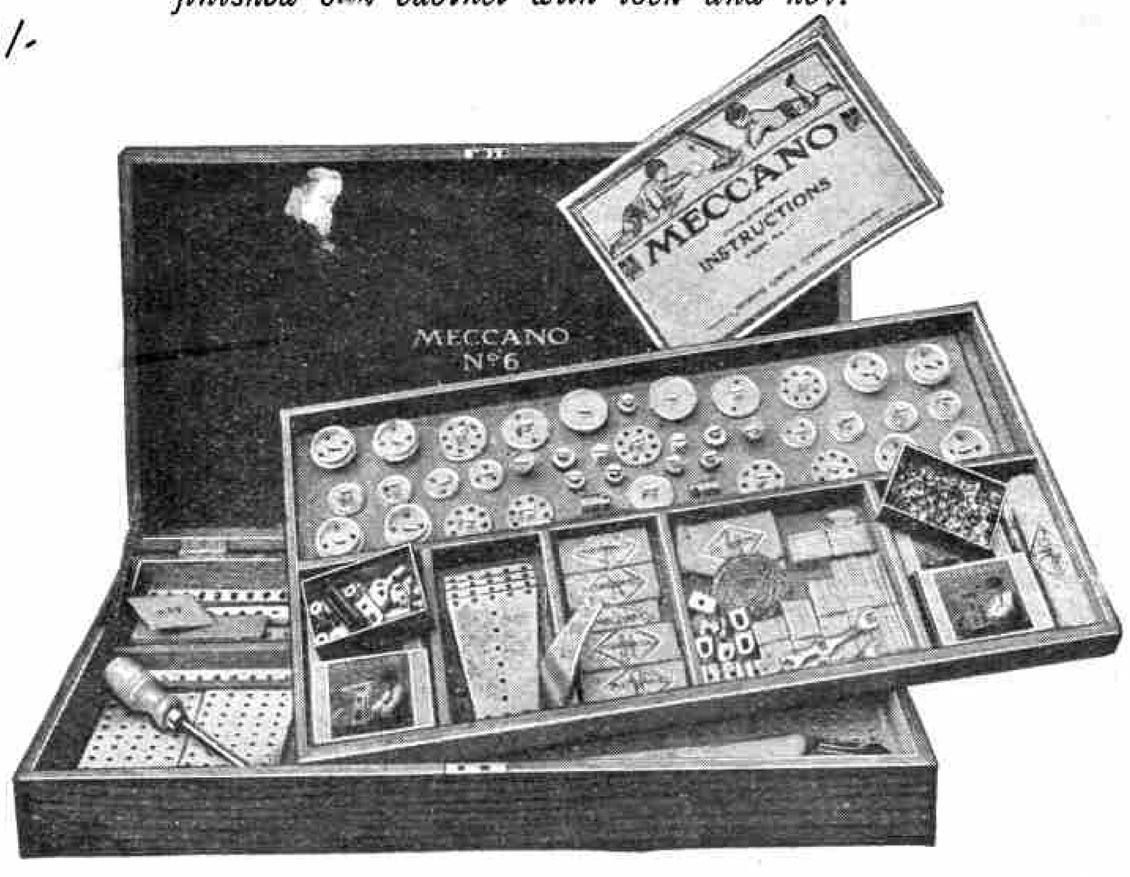
No. 7 Outfit. Builds all the models in the Complete Manual, and many others. Packed in beautifully-finished oak cabinet with lock and key.

PRICE LIST

Accessory Outfits

No. 00a	.. ..	1/6
No. 0a	.. ..	4/-
No. 1a	.. ..	7/6
No. 2a	.. ..	8/6
No. 3a	.. ..	18/6
No. 4a	.. ..	15/-
No. 5a (carton)	..	50/-
No. 5a (wood)	..	80/-
No. 6a	.. ..	210/-

BUILD BIGGER AND BETTER MODELS



No. 6 Outfit. This Outfit builds 360 splendid working models. A No. 6a Outfit, costing 210/- in splendid oak cabinet, converts this Outfit into a No. 7, with which any Meccano model may be built.

ACCESSORY OUTFITS ARE OBTAINABLE FROM ANY MECCANO DEALER

MECCANO LTD. Binns Road LIVERPOOL

FROM OUR READERS

Many of the letters that I receive every day contain at least one point of general interest, which, if written out in the form of a short article, would appeal to my readers. I invite my readers to submit such articles for this page, and if of general interest they will be published as opportunity permits. The articles may deal with such subjects as new ideas for making something; new methods of doing things; accounts of some unusual occurrences or incidents, etc., and should not exceed 500 words. They should be written as neatly as possible and on one side of the paper only. Those articles that are published will be paid for at our usual rates. If desired, illustrations may be sent—either drawings, photographs, or rough sketches. No reader should hesitate to send in an article because he may not be very good at composition or cannot sketch any diagrams necessary to illustrate it. If he states the facts clearly and sends rough drawings I will have his article put into shape, if necessary, and finished drawings made by our artists ready for publication.—EDITOR.

"Into the Land of Fun" at Wembley

My chum and I recently spent a day at Wembley, and after we had explored the Palace of Engineering, the Temple of Venus, and the Canadian and Australian buildings, we made our way to the gigantic Fun Park, determined to have as thrilling a time as possible before we regretfully turned our steps homeward. At the Fun Park all was Noise. [Please put a capital "N" Mr. Editor, because it deserves it!] Here was a roundabout, blaring out the latest ragtime as its nodding horses swept round at a terrific speed. There was the jolting machinery of a cake-walk reminding one of Model 434 in the Meccano Manual! At intervals there was an ominous rumbling sound, and looking up we could see, coming tearing down one of the slopes, the cars of the "Racer," a kind of giant switchback. Clear above the noise of their approach we could hear the screams of the women and girls on board!

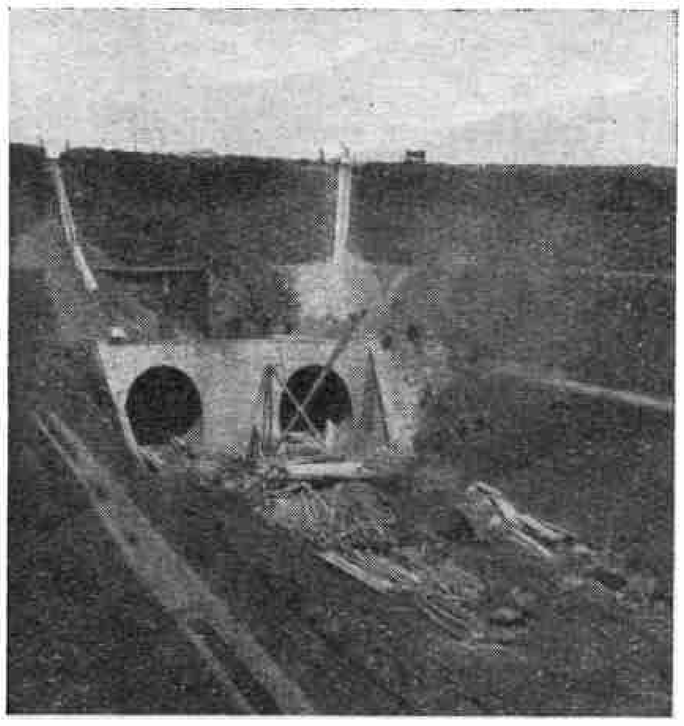
The first thing we ventured on was "The Dodg'em," a most exciting affair. We sat in a small electric car like a big arm-chair, with a steering-wheel and a small knob by our feet. On the outside of the car were steel buffers, the purpose of which we quickly discovered! When the knob was pressed we moved forward and endeavoured to steer our vehicle round the arena, but we seemed able to do nothing but bump into other people! These collisions were not at all dangerous, as each car was well protected by its buffers, and every bump produced shrieks of laughter from the spectators as well as from those immediately concerned. Our Meccano training here stood us in good stead, and we soon hit upon the correct method of steering, so that whenever we wanted to go to the right, we turned the wheel slightly to the left, and *vice versa*. By this method we succeeded in going for a fairly long ride round the enclosure at top speed before the attendant blew his whistle to indicate that time was up.

Next we went on the "Racer." We got in the front compartment of the car, and then began the most thrilling five minutes of our lives! When we got to the top of the first steep slope, up which we were pulled by cable, our car ran along the level until we saw a tremendous drop before us, and down it we went at 50 miles an hour, with the air rushing past like a gale. Mounting the next slope by our momentum, we rounded a curve and shot down another tremendous dip, longer than the previous one. That ride was a glorious sensation, and we felt that we should like to spend an infinite number of shillings on it.

I have not space here to tell of the other marvels we sampled—"Jack and Jill," "Over the Falls," "The Whip," "The Witching Waves"—and I only wish that all readers of the "*M.M.*" could have been with us to enjoy "one crowded hour of glorious life" at the Amusement Park at Wembley.

(R. DUFF, Taplow).

A Double Tunnel in South Africa



"I am sending a photograph of the cutting and mouths of the twin tunnels on the new railroad through Natal, from Durban to Johannesburg. The size of the cutting may be judged from the tunnels side by side, upon which the engineers have been engaged for over two years. The whole of this line will be electrified, the power station being situated in the midlands of Natal."

(C. L. JONSSON, Durban).

A Visit to the British Museum

I HAVE always had a great longing to explore the wonders of the British Museum, and when the opportunity came a few days ago I lost no time in visiting this imposing building. I am a very enthusiastic philatelist, and naturally I first sought out the room containing the stamp collection. Here I found a very remarkable assortment of valuable stamps containing many rarities of all nations, and, needless to say, there were quite a number that I haven't got! My interest was specially aroused by the Hawaiian Missionary stamps, Cape Triangular (4d. red and 1d. blue), and two blocks of twelve of the 1d. black Mauritius.

From the stamps I next went to see the old books. It seemed to me very wonderful to be looking at volumes printed by Caxton and Gutenberg. These books are so well done that it seems scarcely possible that they are the very first printed books. From the old books I turned to the beautiful illuminated manuscripts, the work of the monks of bygone days. These men must have had an enormous amount of patience to carry out such detailed work so perfectly. Many of the capital letters are coloured in blue and gold, and there are hand-painted pictures on each page. Several ancient Greek letters written on papyrus are shown here, and an especially interesting feature is the log book of Nelson's ship "Victory."

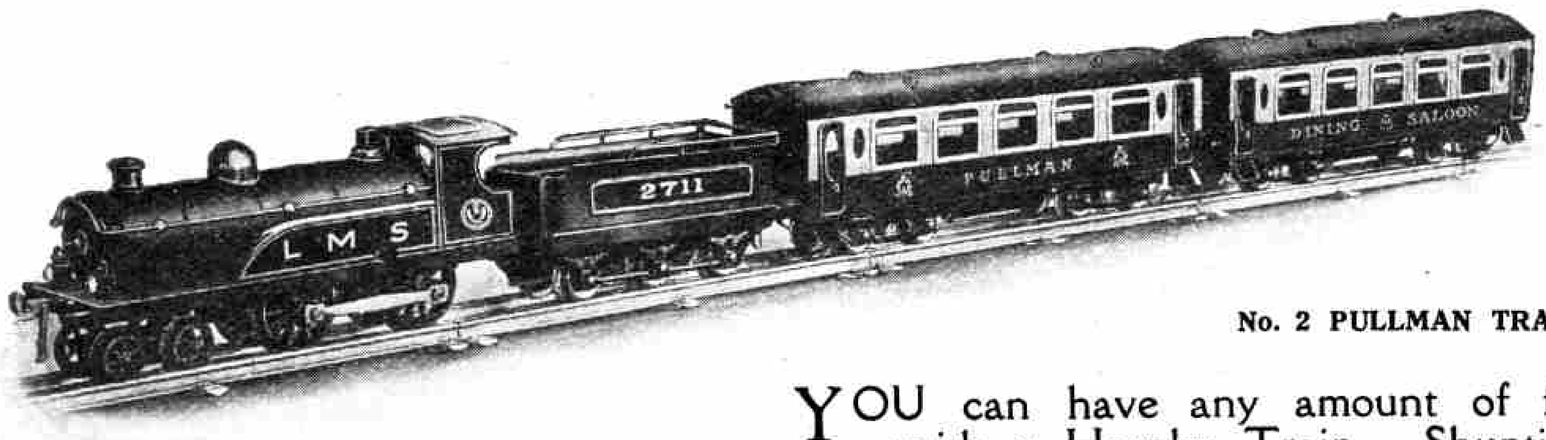
An adjoining room, the entrance to which is guarded by a large bronze figure of Buddha, contains a wonderful collection of Hindu antiquities. As soon as I stepped inside, I saw in imagination Indian princes in dazzling costumes, with glittering scimitars and daggers hanging at their sides. In glass-topped cases are many of these daggers, most of them curved, and all jewel-hilted and with jewelled scabbards. In cases against the walls are many statuettes of Vishnu and other Hindu gods and goddesses. An interesting model in another room close by shows a Vishnu "Juggernaut" car perfect in every detail.

I had only time to give a passing glance to the other rooms containing antiquities from China, Africa, Australia and South America. Among these I noticed cases containing national costumes of the Tibetan people, taken from Lhassa in 1905. A little further on are other cases of great interest to all boys who are fond of stories of Red Indians, for they include among other things, some remarkable Indian costumes, one of which must have belonged to a great chief, as the feathered head-dress sweeps nearly to the ground.

It was now nearing the time for closing the Museum, and very reluctantly I had to drag myself away. When I emerged from the Museum I felt that, although I had only been able to get a hurried glance at a small proportion of the exhibits, I had learned a great deal, and I made up my mind to pay another visit on the first opportunity.

ARNOLD MILLER.

REDUCTION IN PRICES OF
HORNBY CLOCK WORK TRAINS



No. 2 PULLMAN TRAIN

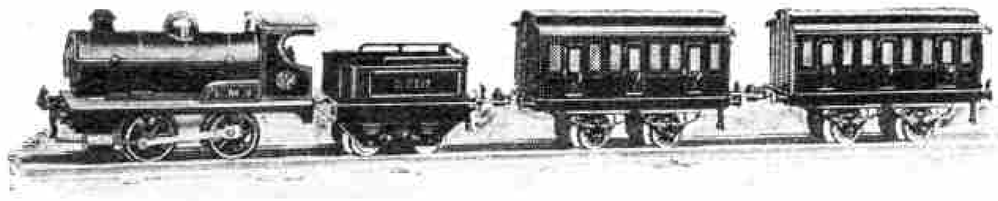
YOU can have any amount of fun with a Hornby Train. Shunting, coupling-up the rolling stock and making up trains will give you hours of pleasure. Hornby Trains are beautifully finished, strongly made, and will last for ever. One of their most valuable features is that all the parts are standardised, and any lost or damaged part may be replaced with a new one.

Guarantee

Hornby and Zulu Trains are tested and their efficiency is guaranteed. A form of guarantee is furnished with each loco, and we undertake to repair, or replace at our option any loco that fails to run satisfactorily from any cause, other than misuse, within 60 days of purchase.

Every train is guaranteed, in accordance with the terms shown above, and you are therefore sure of satisfaction if you buy a Hornby.

A series of articles will shortly be published in these pages telling you how to get the most fun out of your Hornby Train set. You will enjoy reading them, and if you are not yet the proud possessor of a Hornby Train choose one for your next Birthday present — you will never regret it!



No. 1 PASSENGER TRAIN (new type coaches with opening doors)

HORNBY TRAIN PRICES

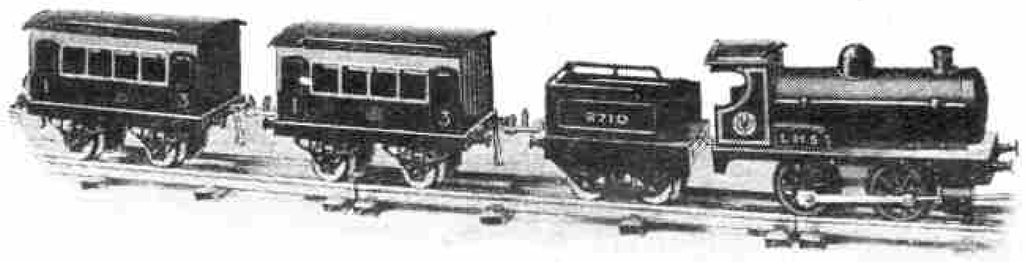
No. 1

Goods Set	22/6	Wagons	each 2/6
Passenger Set	30/-	Tenders	,, 2/6
Locos	each 15/-	Passenger Coaches	,, 5/-

No. 2

Goods Set	37/6	Wagons	each 3/6
No. 2 Pullman Set ...	60/-	Tenders	,, 3/6
Locos	each 22/6	Pullman Cars ...	,, 15/-

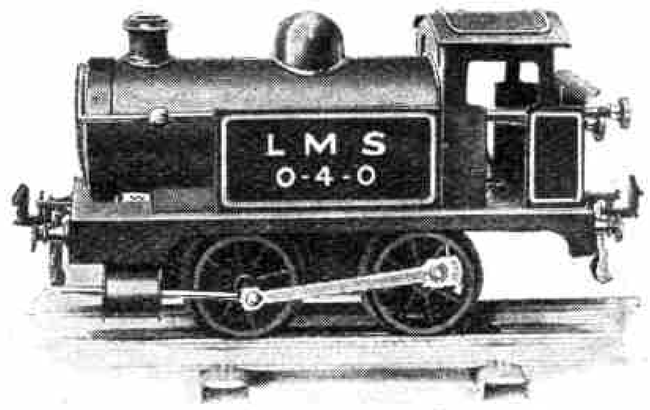
ZULU CLOCK WORK TRAINS



Zulu Passenger Set ...	22/6	Zulu Tenders ...	each 2/-
,, Goods ,, ...	17/6	,, Coaches ...	,, 4/-
,, Locos	each 10/6	,, Wagons ...	,, 2/6

Full particulars of these splendid trains will be sent post free on request.

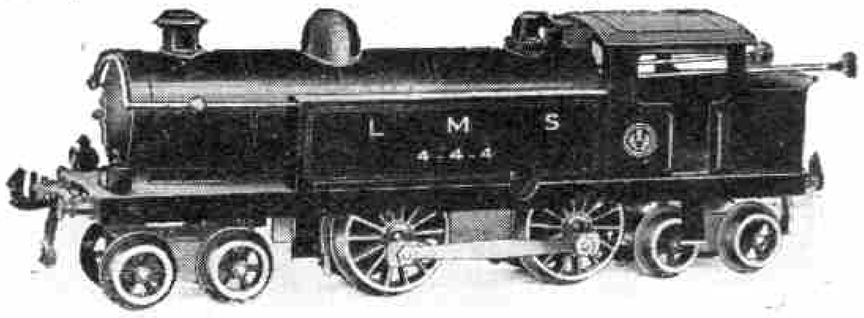
HORNBY TANK LOCOS



No. 1

The Hornby No. 1 Tank Loco is a strong and durable loco capable of any amount of hard work; richly enamelled and highly finished; fitted with reversing gear, brake and governor.

Gauge 0, in colours to represent L.M.S. or L.N.E.R. Companies' Locos 12/6



No. 2

The Hornby No. 2 Tank Loco is a powerful model embodying all the characteristics of the Hornby series, It is 11½" in length and is fitted at both ends with a four-wheeled bogey. Beautifully finished in colours; lettered L.M.S. or L.N.E.R., with reversing gear, brake and governor. Suitable for 2 ft. radius rails only.

Price 30/-

OBTAINABLE FROM ALL MECCANO DEALERS

(*Continued*)

WHEN I came to Mr. Constantinesco's stand in the Palace of Engineering I felt I had at least one friend in this great building, for I remembered the articles on Mr. Constantinesco and his inventions that have appeared recently in the "*M.M.*" On this stand was the chassis of a full-sized Beardmore locomotive fitted with the Torque Converter, also a motor-car and several very interesting models. A machine-gun fitted with the invention for firing through the propeller of an aeroplane was also on view.

On the next stand was a combined shunting and crane locomotive which lifts seven tons. It is chiefly used for rapidly unloading the wagons in dockyards and shipyards, and it struck me as being a very interesting subject to build in Meccano. On the opposite side of the avenue was a wonderful model of the Manchester Ship Canal and Docks, measuring over 40 ft. in length and 20 ft. in breadth, and also showing a model of a grain-elevator and discharging plant. In Bay 55 there was some fine Spinning Machinery, but what interested me more was the stand where Vickers Ltd., the famous Sheffield steel-makers, showed a huge naval gun that would throw a shell weighing over 2,000 lbs. a distance of 20 miles. This shell would pierce hard-faced steel armour 2½ ft. thick at a range of 10 miles! They also showed special gearing for turbines, some fine models of battleships and cruisers, and a heap of other interesting things.

I felt as though I could spend many days in this wonderful building, but I realised that, if I were to complete my tour in the time allotted, I must hurry on. I therefore left the Engineering section behind me with regrets and entered the Palace of Industry, a building equally vast.

Spinning and Weaving

Here there was a great noise—the hum of many machines at work making all manner of things, with attendants in different coloured uniforms moving

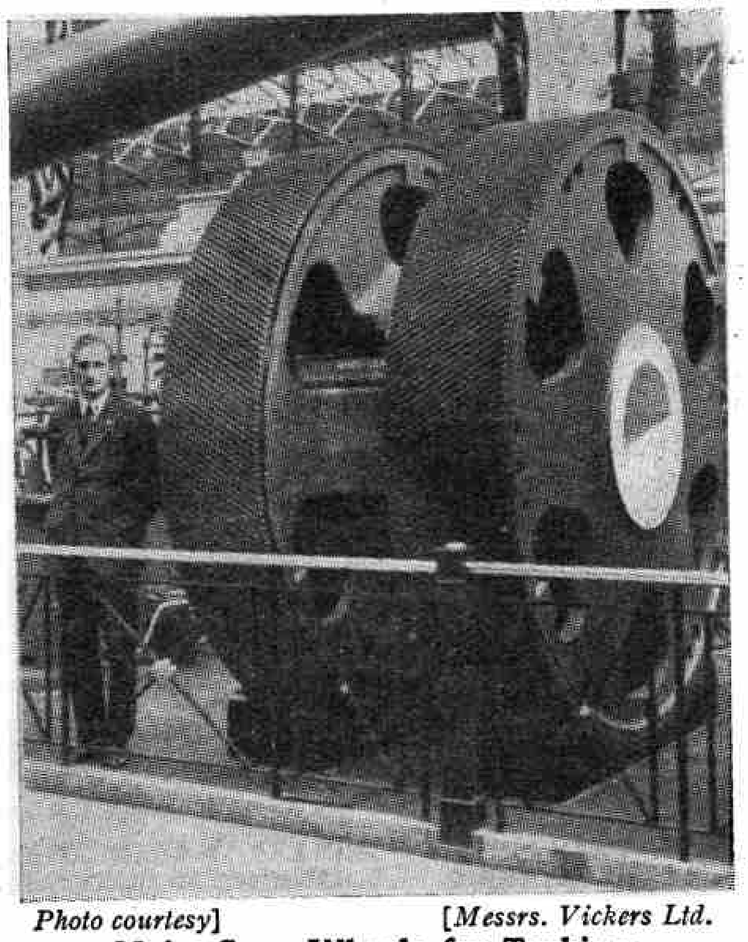


Photo courtesy] [*Messrs. Vickers Ltd.*

Main Gear Wheels for Turbines

about attending to the various mechanisms. I was almost bewildered by the wonderful sights before me, but I could not help feeling a thrill of pride as I looked down the long avenues and realised that here were shown some of the finest and most wonderful machines that British engineers have produced.

Directly in front of me was the Textile section with machines at work showing the numerous processes of the cotton industry. These machines, which run from 11-30 to 12-30 a.m. and 2-30 to 4-30 p.m. each day, include a Self-Acting Mule and Roving, Slubbing and Drawing Machines.

There were also in this section Jacquard and Dobby Looms, and a wonderful loom that makes Turkish towels. I found these looms all very interesting and quite easy to understand, for the working principles are the same as in the famous Meccano Model Loom. I confess I was puzzled by the intricacies of a Tapestry Loom exhibited by Messrs. Hattersley & Sons Ltd., on Stand 301a. This machine is a real marvel, and weaves wonderful tapestry pictures similar to those seen on the walls of ancient castles and in museums. I noticed it stated that in the pattern being woven there were 10,250 warp threads and 30 colours of weft passing through the warp. There are 2,680 needles and 11,600 Jacquard cards, and on the occasion of my visit the loom was weaving a picture of "Bolton Abbey in the Olden Time."

I stood for a long time watching some more looms weaving suit lengths, and it amazed me to see how quickly the shuttle was sent flying through the warp threads by a terrific blow from the picking stick. Backwards and forwards the shuttle flew, so quickly that it was almost impossible to follow it with the eye.

Slate-Splitting Extraordinary

Quite a change was seen in the next section, where the Festiniog Quarries showed exhibits of slate-splitting. An amusing rhyme, painted on a slate, stated:—

"Tiles may come
and tiles may go
But slates go on
for ever."

Slates are split by chisel and mallet, and from a block one inch thick sixteen separate sheets of slate are obtained, each without a flaw! Of course, only highly-skilled workmen can do this, and I could not help noticing their delicate hands, quite in keeping with the class of work on which they are employed. The slate in the Festiniog

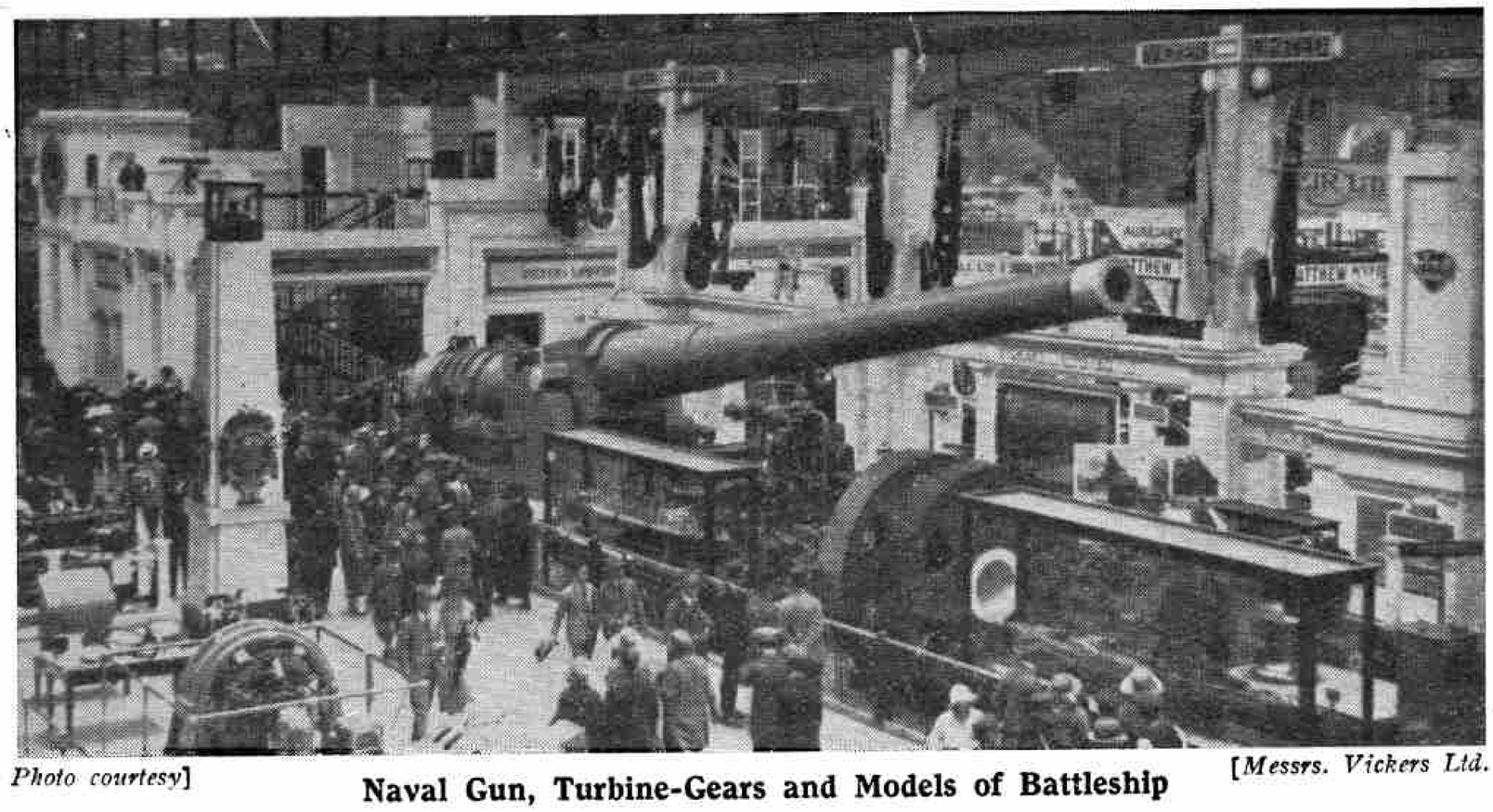


Photo courtesy] [*Messrs. Vickers Ltd.*

Naval Gun, Turbine-Gears and Models of Battleship

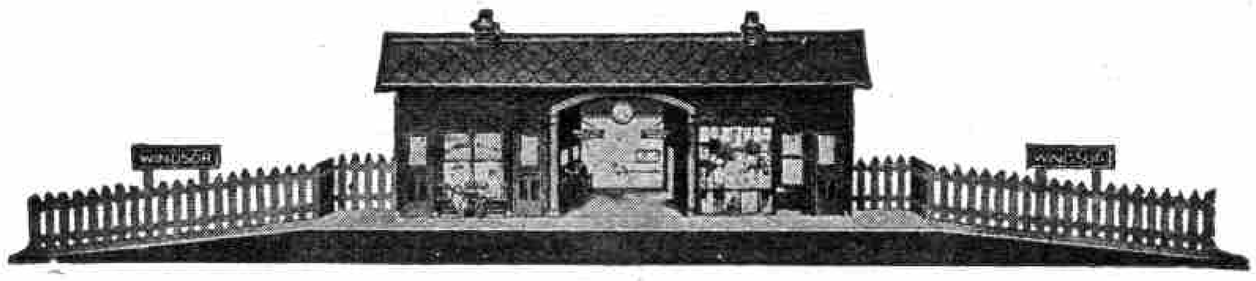
New Rolling Stock and Accessories

(HORNBY SERIES)

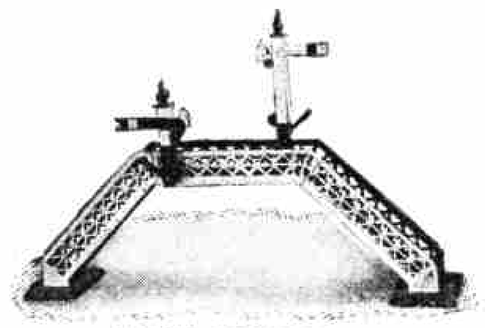
WE announce below several new train accessories, including Level Crossing, Signal Cabin, Snow Plough, Tunnel, New Wagons, Junction Signals and Platform Accessories. All are built in correct proportion to the size, gauge, method of coupling, etc., of the Hornby Trains. Most important of all they have the uniformly beautiful finish which is the great feature of the Hornby System. To use cheap-looking rolling stock or a foreign-looking station with a Hornby Train completely spoils the effect.

THE WINDSOR STATION is a thing of beauty—the only really British station obtainable. Its bright colouring and realistic appearance will bring joy to the heart of every boy who sees it.

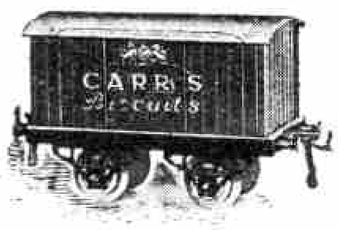
TUNNEL
Price **7/6**



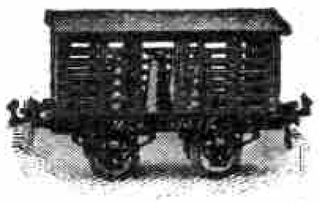
WINDSOR STATION
Excellent model, beautifully designed and finished
Dimensions : Length 2 ft. 9 in., breadth 6 in., height 7 in. Price **12/6**



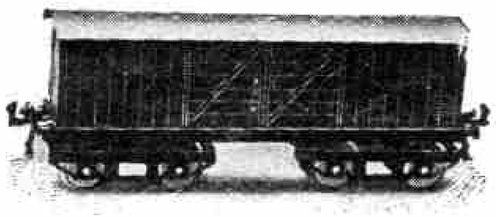
FOOT BRIDGE
With detachable signals. Price **6/-**
Without signals. Price **3/6**
Signals, per pair **2/9**



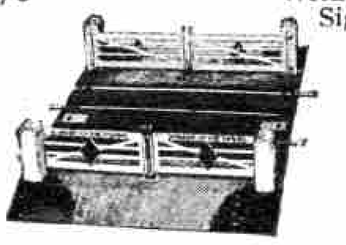
CARR'S BISCUIT VAN
Price **4/-**



MILK TRAFFIC VAN
Fitted with sliding door, complete with milk cans. Price **4/6**

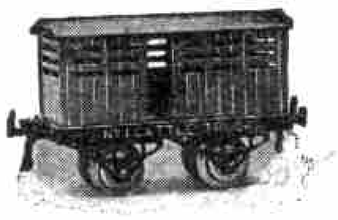


No. 2 LUGGAGE VAN
Finished in colour. Fitted with double doors. Suitable for 2 ft. radius rails only. **Price 6/6**

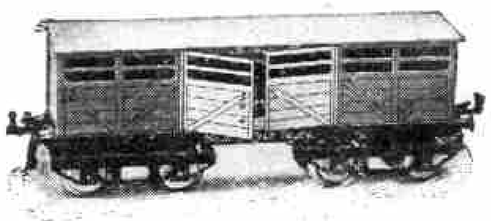


LEVEL CROSSING
Beautifully designed in colour. Measures 11½ in. × 7½ in., with Gauge 0 Rails in position.
Price **6/6**

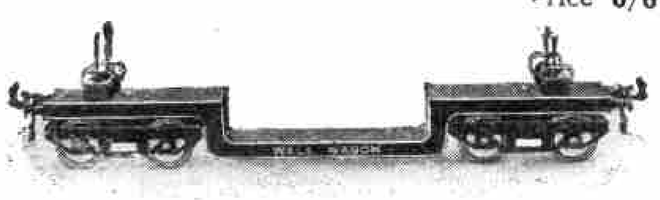
SNOW PLOUGH
Finished in grey, with revolving cutter driven from front axle.
Price **5/6**



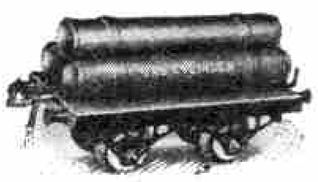
No. 1 CATTLE TRUCK
Fitted with sliding door, Very realistic design.
Price **4/-**



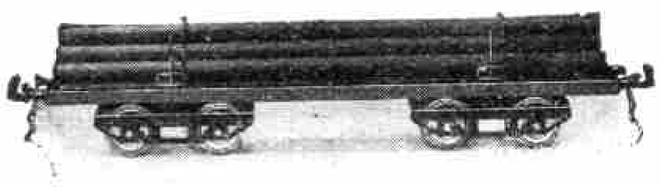
No. 2 CATTLE TRUCK
Splendid model, fitted with double doors. Suitable for 2 ft. radius rails only. Price **6/6**



TROLLEY WAGON. Finished in colour. Suitable for 2 ft. radius rails only. Price **6/-**

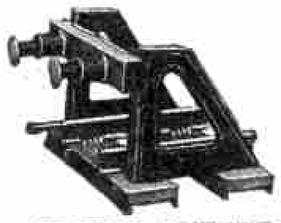


GAS CYLINDER WAGON
Finished in red, lettered gold.
Price **3/-**

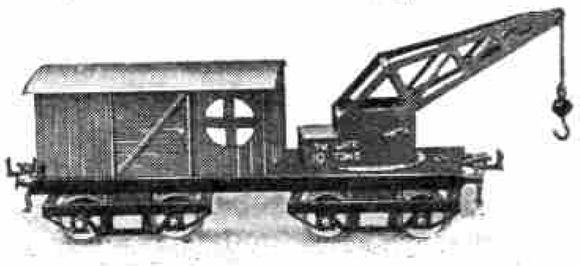


No. 2 LUMBER WAGON
Fitted with bolsters and stanchions for log transport. Suitable for 2 ft. radius rails only. Price **5/-**

No. 1 LUMBER WAGON
Fitted with bolsters and stanchions for log transport. Price **2/-**



SPRING BUFFER STOP Price **1/6**

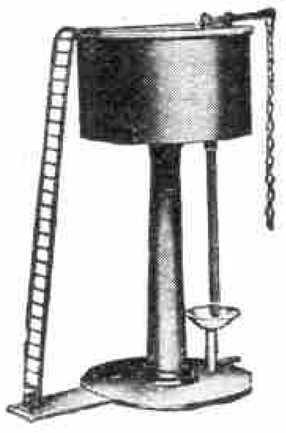


BREAKDOWN VAN AND CRANE
Excellent finish. Beautifully coloured. Suitable for 2 ft. radius rails only. Price **7/-**

PLATFORM ACCESSORIES No. 1
Price (per set) **2/-**

PLATFORM ACCESSORIES No. 2
Price (per set) **2/-**

PLATFORM ACCESSORIES No.
Price (per set) **2/-**

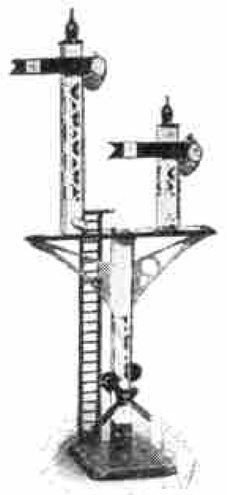


WATER TANK
Brightly coloured in red, yellow and black, 8⅛ in. in height, with flexible tube and pump lever.
Price **6/6**

LOADING GAUGE
Price **1/9**

SIGNAL CABIN
Dimensions : height 6⅓ in., width 3½ in., length 6⅓ in. Finished in colour and lettered "Windsor." Roof and back open to allow signal-levers to be fitted inside cabin if desired. Price **6/6**

DOUBLE LAMP STANDARD
Four-volt bulbs may be fitted into the globes.
Price **4/-**



JUNCTION SIGNAL
Signal arms operated by levers at base. Very realistic model standing 14 in. in height. Price **5/6**

ASK YOUR DEALER TO SHOW YOU SAMPLES

quarries is sixteen million years old. Slate is really nothing less than the solidified mud of our prehistoric seas, and it seems marvellous that these ancient deposits should be made to serve innumerable uses in our day.

Baffling the Burglar

A little further on was a splendid exhibit of Chubb's safes, which looked strong enough to defy the attempts of the most expert safe-breakers. Some of the safes had combination-locks, the operating dials of which reminded me of the condenser knobs on my radio set. A very ingenious type, called the "Lighthouse Safe," is a huge steel globe, fitted with a small door and mounted on a pedestal. When all is locked up, the globe revolves continuously and a light shines from the top. It is impossible for this safe to be tampered with, because of its constant movement, for if this be stopped the light goes out and an alarm bell rings! I wonder if any safe-breaker will ever manage to "crack" one of these safes—he will certainly have a dizzy time following the safe round as it revolves!

A large section of this building is devoted to musical instruments, but I had only time to notice the piano part. I had no idea that there was so much work in a piano until the man in charge of the exhibit told me there were over 5,000 parts in an ordinary piano and 6,000 parts in a grand piano! These parts are all displayed mounted in cases, so that even the most minute details of the piano-action are shown.

From Pulp to Paper

A huge paper-making machine performs the whole process by which pulp and water are converted into paper, from 11-30 a.m. to 5-0 p.m. every day. At one end of the machine there is a stream of pulp and water flowing on to a travelling band of fine mesh wire something like wire cloth. As this stream of pulp is carried forward the water drains off, passing through the wire mesh. The pulp is then left on the travelling band in the form of a thin skin, called the "web," which is passed through huge rollers to squeeze out the water. Then it is dried by being passed over steam-heated cylinders, and it comes out at the end of the machine to be wound off on huge rollers, ready for despatch to the newspaper office. It all looked so delightfully simple, but I remembered that the machine was perfected only as the result of many years of experience.

The Exhibition Post Office is near here, and I spent some time at the door examining the interesting exhibits of foreign stamps in glass cases. I particularly noticed some fine Triangular Capes, which I should very much have liked to take home with me, but the cases were securely screwed to the wall!

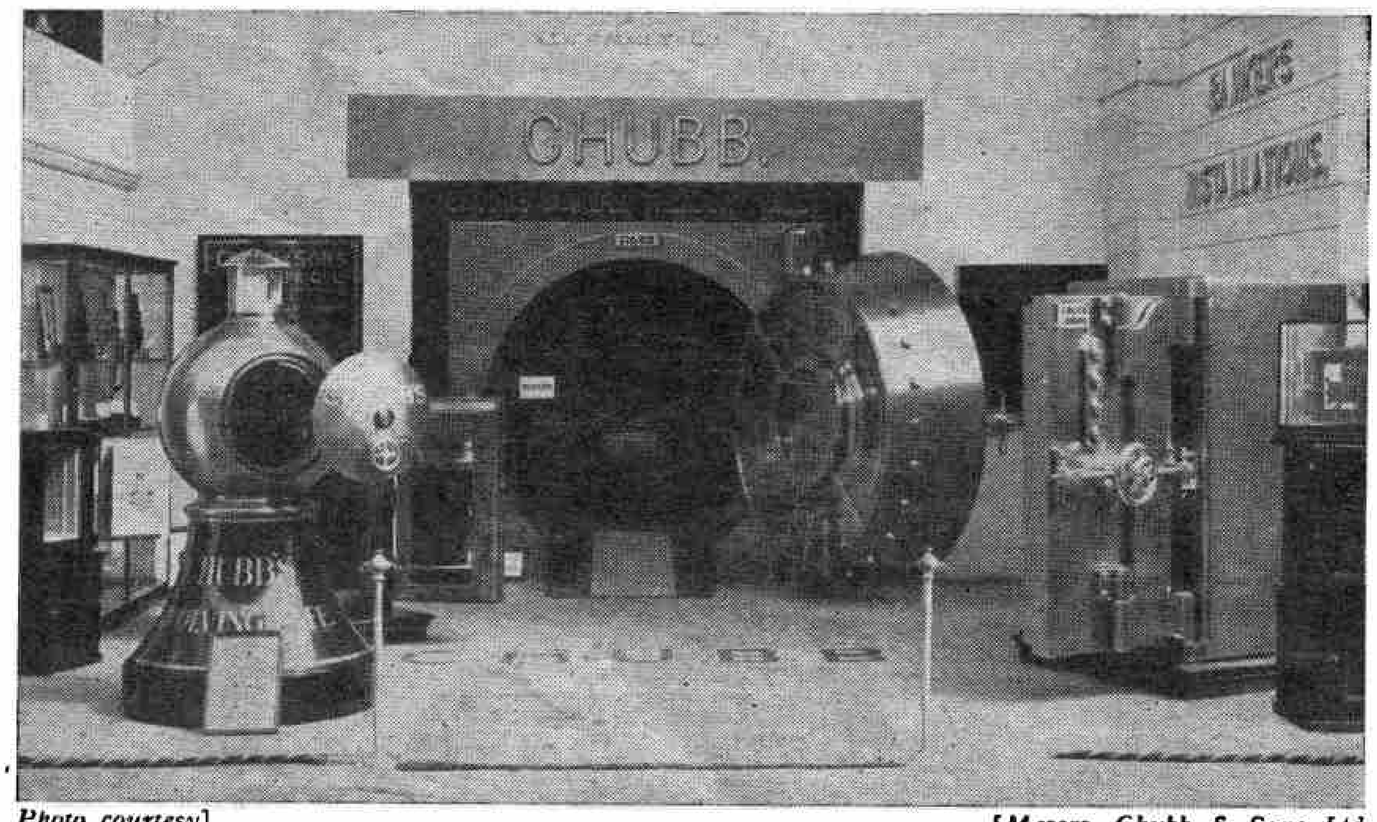


Photo courtesy] [*Messrs. Chubb & Sons Ltd.*

Safes and Strong-Rooms

(Chubb's Lighthouse Safe is seen on the left. Notice the thickness of the huge door of the Treasury Vault)

Biscuits and Chocolates

It was quite a pleasing change, after seeing cloth and paper in the making, to come to something even more interesting—the exhibits dealing with the manufacture of things in the eatable line. At one stand they were making very appetising-looking biscuits by machines that handled the whole business from weighing out the flour to packing the biscuits in tins. The biscuits were baked in long ovens through which they passed on a travelling band, and thousands upon thousands of them were made every hour. The machines used in making these biscuits were about 30 yards in length and the biscuits went through all the processes without being removed from the wide band on which they travelled. Instead of looking like a biscuit machine I am sure it could easily be mistaken for a coal conveyor!

On the next stand (Carson's Chocolates) toffee was being made at the rate of 200 lbs. an hour and a giant machine was mixing chocolate in four huge buckets. The machine mixes 2½ tons of chocolate at a time, using cocoa nibs that have been ground to powder by machines with two big grinding wheels revolving over pans. Indeed, all the machinery on this stand looked more suitable for mixing concrete or mortar than for mixing chocolate, but one of the attendants explained to me that the firm's output is such that huge machinery of this nature is necessary for them to keep up with the demand. He told me also that Carson's had supplied the chocolate for most of the famous expeditions in recent times, including those of Shackleton in 1914 and 1921 to the Antarctic, and the recent Everest expedition.

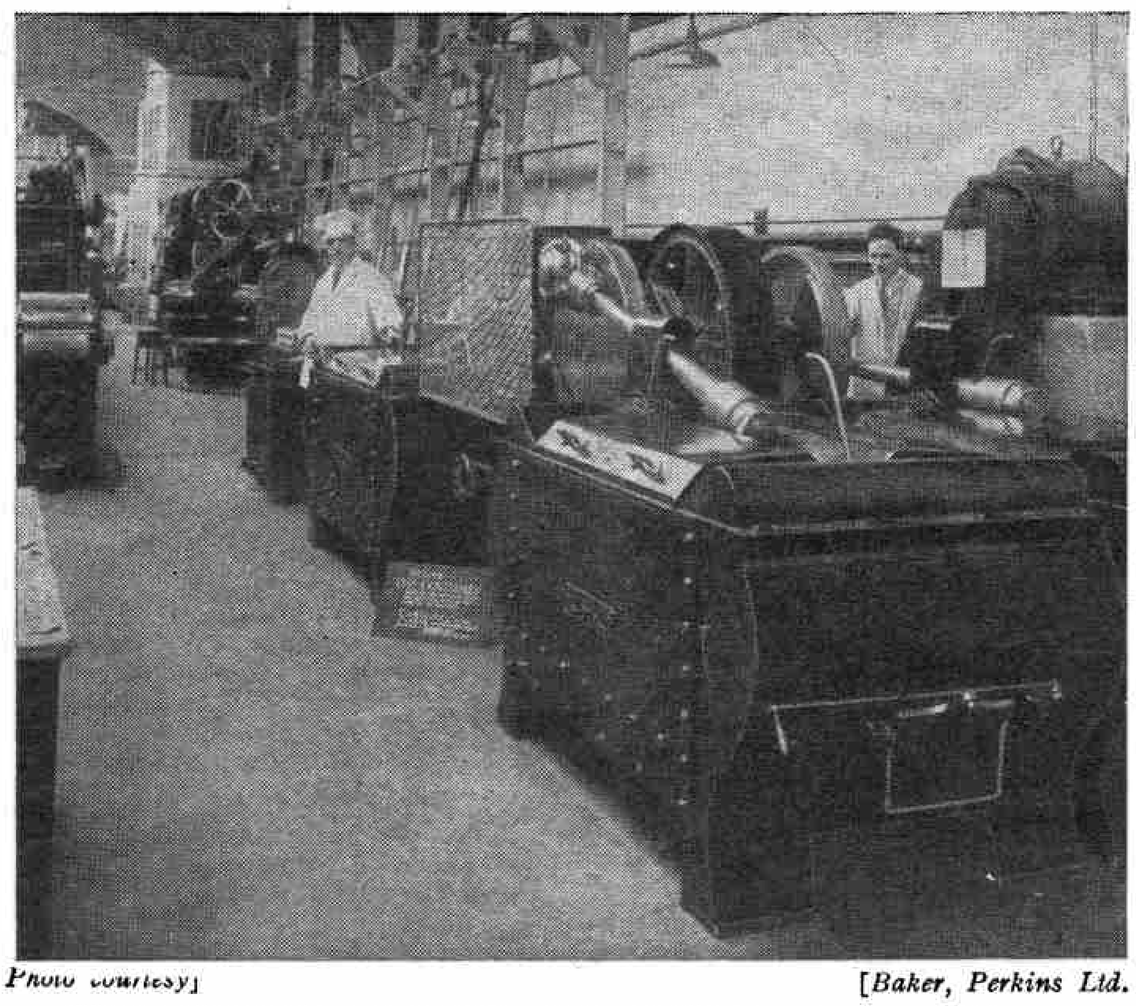


Photo courtesy] [*Baker, Perkins Ltd.*

Huge Chocolate-mixing Machine at Messrs. Carson's Stand

12,000 Loaves an Hour

Bread-making is a very interesting industry and one that we do not often hear about. Huge machines mix the dough, knead it, and weigh it out into loaves in a very different manner from that in which bread is made at home.

The unbaked loaves are carried by a kind of endless rack into a huge oven which looks about the size of an ordinary house. When they are baked, the loaves come from the oven on an endless belt, tumbling and jostling each other down an incline, like the people on the Helter-Skelter in the Amusement Park! Then they are caught by steel hands, placed in a piece of paper, wrapped up, labelled and passed along to be stacked ready for sale. A single machine of this kind can deal with 12,000 loaves an hour, and from flour to wrapped loaf the bread is never touched by a human being!

For Mothers and Sisters

Leaving the bread-making I passed through the Central Hall, with its gold columns 24 ft. in height and surmounted by heraldic designs, and came to a kind of arcade filled with show-cases of beautiful shoes of all kinds—kid, satin, brocade and skin. Some had jewelled heels and flashing buckles, but shoes don't interest me very much so I only stayed long enough to

(*Continued on page* 275)

Brandes

The Name to Know in Radio

Result of 16 years' experience

A smile of obvious content—

25/-

British Manufacture *(B.B.C. Stamped). Manufactured at Slough, Bucks*

Just think! This young enthusiast athirst for information and it all comes to him by wireless and a "Brandes." Mother deplores the fact that it's sporting information he's on fire for, and the "Guv'nor" gives a satisfied chuckle. But there are talks crammed full of interest, good music, and facts and figures which are a further education, a widening influence on his young outlook. Get Brandes—the "***Matched Tone***" feature means a distinct and rich-toned accuracy, they are strong, durable, reasonably priced and carry an official guarantee enabling you to return them within ten days if you are not entirely satisfied. *Obtainable from any good dealer.*

Matched Tone

TRADE MARK

Radio Headphones

WIRELESS TIME-SIGNALS

How the World's Clocks are Kept Accurate

NO doubt many thousands of our readers are familiar with the time-signals sent out daily by the British Broadcasting Company. These signals, which sound like dots of the Morse code, are sent over the wire to the broadcasting station by Greenwich Observatory, and tens of thousands of listeners find them useful for correcting their clocks and watches each night. It has been said, indeed, that since they have been broadcast there has been a marked improvement in the punctuality of the nation, and not nearly so many trains have been missed as was formerly the case.

In addition to these broadcast signals there are other wireless time-signals that play a very important part in the daily programme of many thousands of sailors on the high seas. In fact it is no exaggeration to say that one of the most important purposes that wireless serves is to communicate Greenwich Mean Time to ships at sea.

Before the days of wireless, ships were compelled to rely upon obtaining the correct time from their chronometers, the accuracy of which it was impossible to check while at sea. On a long ocean voyage, therefore, the error between the chronometer and Greenwich Mean Time grew from day to day, and often became so great as to cause a ship to go many miles out of its course. Some idea as to what this means may be judged by the fact that at the Equator an unknown and unallowed-for inaccuracy of four seconds of time would cause the sailor to make an error of one mile when finding the position of the ship.

The Importance of Greenwich Mean Time

To find the longitude of a ship at sea it is necessary to compare the local time with the time at Greenwich. The local time is found by observing some convenient heavenly body, such as the sun or moon, and the Greenwich time is taken from the chronometer, which is merely a special kind of clock that keeps time very accurately. Taking the difference between these two times, and allowing four minutes of time for one degree of longitude, the longitude of the ship east or west of Greenwich is quickly obtained.

Since the time at Greenwich is an essential factor in this calculation, it is obvious that if this is not known accurately it is impossible to find the exact position of the ship. The necessity for knowing the position of the ship is obvious, for without it the captain is unable to tell whether he is steering in the correct direction, whether he has drifted, how far he has travelled since he last found his position, and so on. It is in giving the correct time that wireless becomes so useful.

Radio Time-Signals

Many countries now have wireless stations from which the time is broadcast at least once a day, and these signals may easily be picked-up by receiving sets in this country. The most important of the stations sending time-signals are Eiffel Tower (Paris), Lyons, Nauen, Annapolis, Arlington, Honolulu, and San Francisco. These and the other time-signal stations are so placed that any ship will always be within range of one or other of them.

Eiffel Tower, being the nearest, is the best known to English listeners, and as its transmission is very powerful it may be often picked-up with an ordinary crystal set. The signals regularly work a loud-speaker in the Liverpool district on two valves of a simple non-super circuit with a special tuning coil to tune in to the wave-length of 2,600 metres. "International Ordinary Time-Signals" are transmitted every day from the Eiffel Tower between 10.0 a.m. and 10.5 a.m., between 10.44 a.m. and 10.49 a.m., and 10.44 p.m. and 10.49 p.m. (These times are Greenwich Mean Time, and one hour should be added at present to correct for Summer Time).

The 10 a.m. time-signal opens with — . — . — ("beginning of message") repeated several times, then "ordinary time signals," then . — . . . meaning "wait." After this, and for the next five minutes, a dot is transmitted every second, with a dash in place of every sixtieth dot. These dashes are not guaranteed to fall at the beginning of a minute, but the dots are guaranteed to fall at intervals of exactly one second. This signal is transmitted for the benefit of ships, and by means of it the officer in charge is able to check the speed of his chronometer and so measure its daily error.

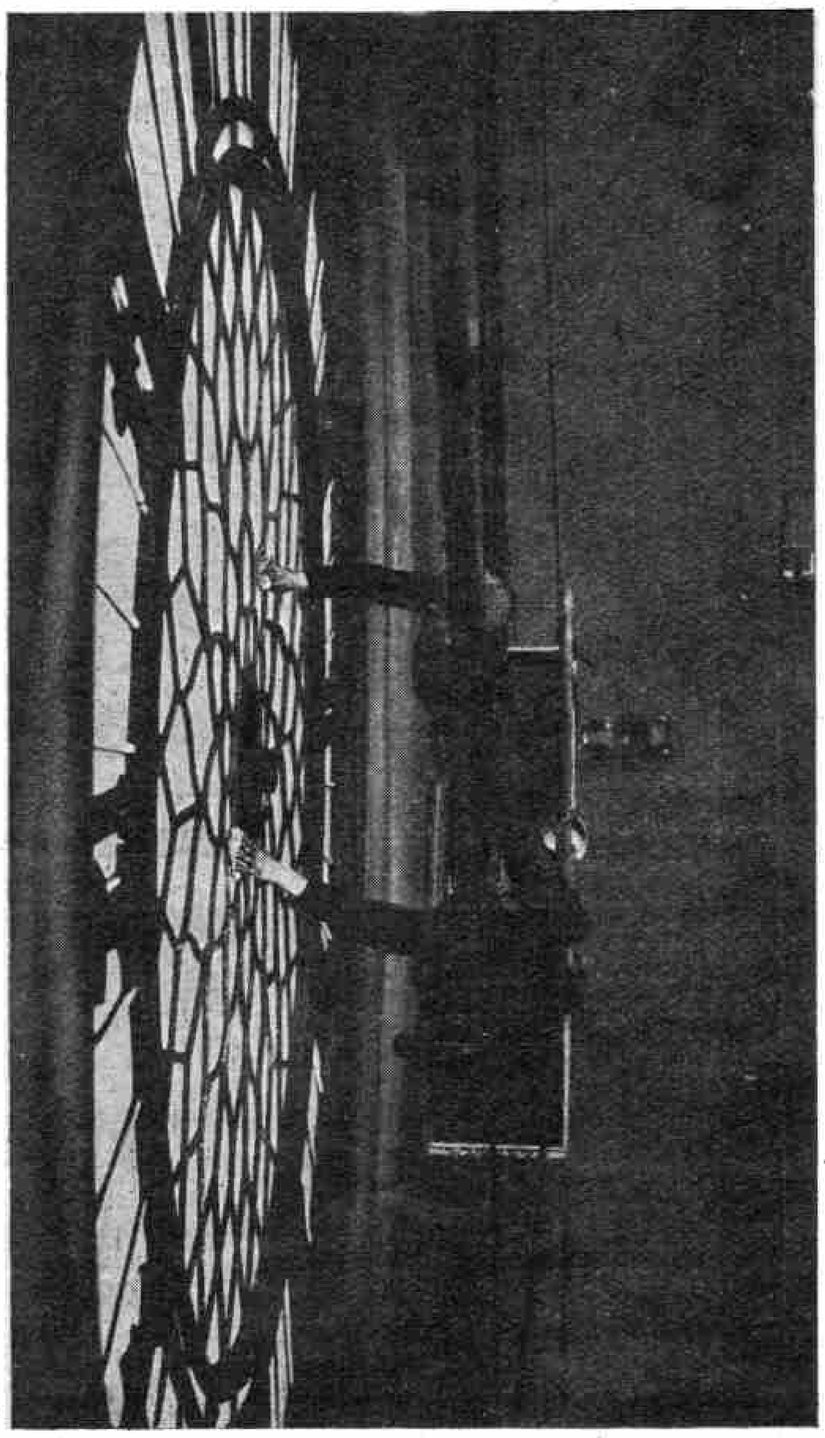
Setting the World's Clocks

More interesting to land listeners are the 10.44 to 10.49 p.m. signals, for besides setting your watch by the signal that sets the clocks of the world, you can test its daily gain or loss to the nearest second. It is also interesting to test the accuracy of the compensation of the balance wheel. To do this, see how many seconds fast or slow the watch is in the morning and then wear it in your waistcoat pocket all day, where it will be kept at a fairly high temperature. Notice, by the evening time-signal, how much it has gained or lost during the past 12 hours. If you then take it out of your pocket and leave it in some cool place, preferably in the same upright position, you can test its accuracy for the next twelve hours. You can then compare the two results and form an estimate of the accuracy of the compensation. For perfection the results should be the same.

The time code for the 10.44 to 10.49 signals, whether a.m. or p.m., is as follows:—

After the introductory signals, beginning at 44 minutes past the hour, is a series of dots, the first dot finishing at 44 mins. 1 sec. and the series continuing until 54 secs. At 45 min. 0 secs. one dot begins. One minute's interval now passes, to be followed by a series of — . . the first of which finishes at 46 min. 3 secs. These continue every four seconds until the last one finishes at 55 seconds past. At 47 min. 0 secs. a dot begins, followed by another one-minute interval. After this a series of — . . . . the first of which finishes at 48 min. 5 secs. and which continue every 5 secs. until the last finishes at 55 secs. A dot then begins exactly at 49 min. 0 secs. This completes the signals.

(*Continued on page* 261)



Big Ben Has a Wash!

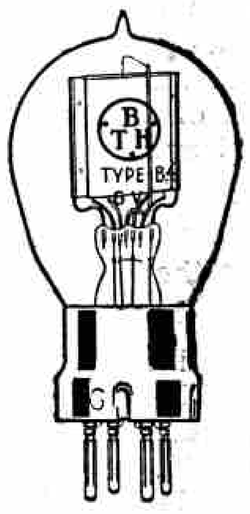
It is necessary to wash Big Ben's face periodically, and our illustration shows how this is done. A swinging cage carries the cleaners high up above the street below. As may be judged from our photograph the work requires strong nerves and a cool head.

Five B.T.H. Radio Valves

including two new types

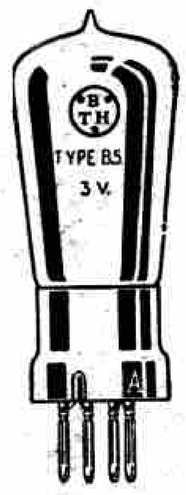
B T-H

THE introduction of the new B3 and B6 valves makes the B.T.H. range complete. There is now a B.T.H. valve for every need and every purpose, and each is unsurpassed in its particular class.



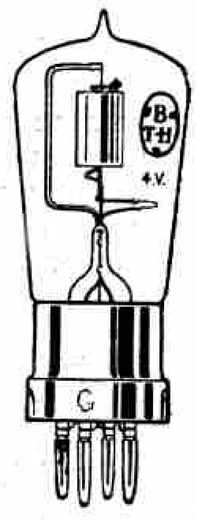
B4 TYPE VALVE, 35/– each. The B4 valve has a very great amplification factor and is free from distortion. It is the ideal valve for loud speaker work.

Filament volts ...	6 volts.
Filament current ...	0.25 amp.
Anode volts	40-100 volts.



B5 TYPE VALVE, 30/– each. The B5 valve takes only 0.06 of an ampere, and can be operated from standard dry cells.

Filament volts ...	3 volts.
Filament current ...	0.06 amp.
Anode volts	20-80 volts.



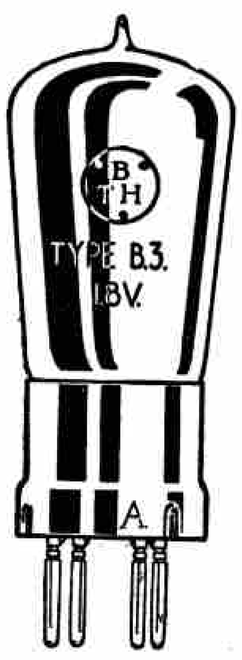
R TYPE VALVE, 12/6 each. There is no better 'general purpose' valve. It functions equally well as detector or amplifier, and gives excellent results on all circuits—reflex and otherwise.

Filament volts ...	4 volts.
Filament current ...	0.63 amp.
Anode volts	20-80 volts.

The two new types

B3 TYPE, 21/- each.

Filament volts	2 volts.
Filament current	0.35 amp.
Anode volts	20-80 volts.



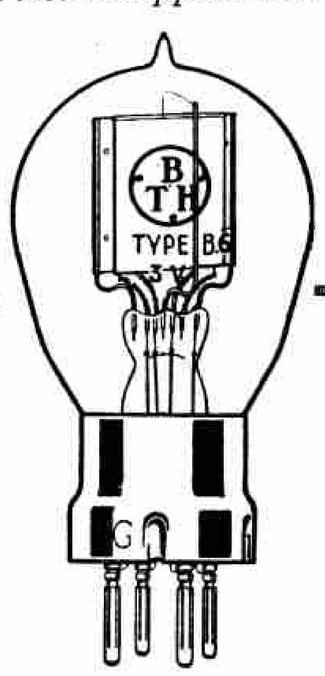
THE B3 VALVE has been developed to meet the need for an efficient 'general purpose' receiving valve which can be operated from a dry battery. The filament of the B3 requires only *half the volts and half the amps.* required by the 'R' valve, but gives the same excellent results as the latter. **THE B6 VALVE** is similar to the world-famous B4 in respect of economy and amplification, but, owing to its lower filament voltage (3 volts), can be used more conveniently with other valves.

Both these new valves, like all B.T.H. valves, are fitted with standard British 4-pin caps, so that no special adaptors are needed.

B6 TYPE.

Filament volts	3 volts.
Filament current	0.12 amp.
Anode volts	60-120 volts.

Price on application.



Obtainable from all Electrical and Radio Dealers, Stores, etc.

The British Thomson-Houston Co. Ltd.,

Works : Coventry. **Offices : Crown House, Aldwych, W.C.2.**

Branches at Belfast, Birmingham, Bristol, Cardiff, Dublin, Glasgow, Leeds, Liverpool, Manchester, Middlesbrough, Newcastle, Sheffield, Swansea.

How Wireless Valves are Made

An Industry Marvellous in Exactitude and Efficiency

WE recently had an opportunity of inspecting the Valve-making Department at the works of Messrs. The British Thomson-Houston Co. Ltd. at Rugby. We found the processes employed in the manufacture of wireless valves to be so interesting that we determined to give to our readers some account of the varying stages through which a valve passes before it finally reaches their hands and is used in their Radio sets.

The method by which a wireless valve functions has already been fully explained in these columns (the subject was dealt with at length in our pages from October 1922 to February 1923), but it will make the process of manufacture more clear if we briefly describe how a valve functions.

Filament, Anode and Grid

A valve depends for its action on the fact that when a metal wire (called the "filament") is heated in a vacuum, electrons are emitted from the surface of the wire and fall upon the plate, or "anode" as it is called, after passing through a grid. The metal used for the filament may be platinum, tungsten, molybdenum or tantalum, and it is essential that this wire be enclosed in a vacuum, for if it were not so enclosed it would immediately oxidize when heated to the necessary temperature in air.

We are thus able to appreciate one of the difficulties with which valve manufacturers have to contend, for they have to make filament, anode, and grid, mount these together, enclose them in a bulb and then extract all the air and seal the bulb.

The Function of the Grid

The anode usually takes the form of a cylinder of metal, which surrounds the filament. Sometimes the anode consists of two flat metal plates which are mounted on opposite sides of the filament.

The grid generally consists of a spiral of wire, also surrounding the filament, but placed inside the anode so that it comes between the two. In a certain measure it acts as a gate, controlling the flow of electrons emitted by the filament When the grid is charged positively with respect to the filament it encourages the flow of electrons through it to the anode, but if charged negatively it repels some of the electrons and reduces the current flowing from filament to anode.

If the grid is made positive and negative alternately, it will cause corresponding variations in the current flowing through the valve. It is because of this property that the valve is so useful in Radio, for every small change in the grid charge causes considerably larger changes in the current flowing to the anode. The amplifying and detecting properties of the valve depend upon correctly using the grid and upon its controlling effect on the stream of electrons emitted by the filament.

Now that we have gained a rough idea of the working of a wireless valve it is easier to understand the various processes that are employed in its manufacture.

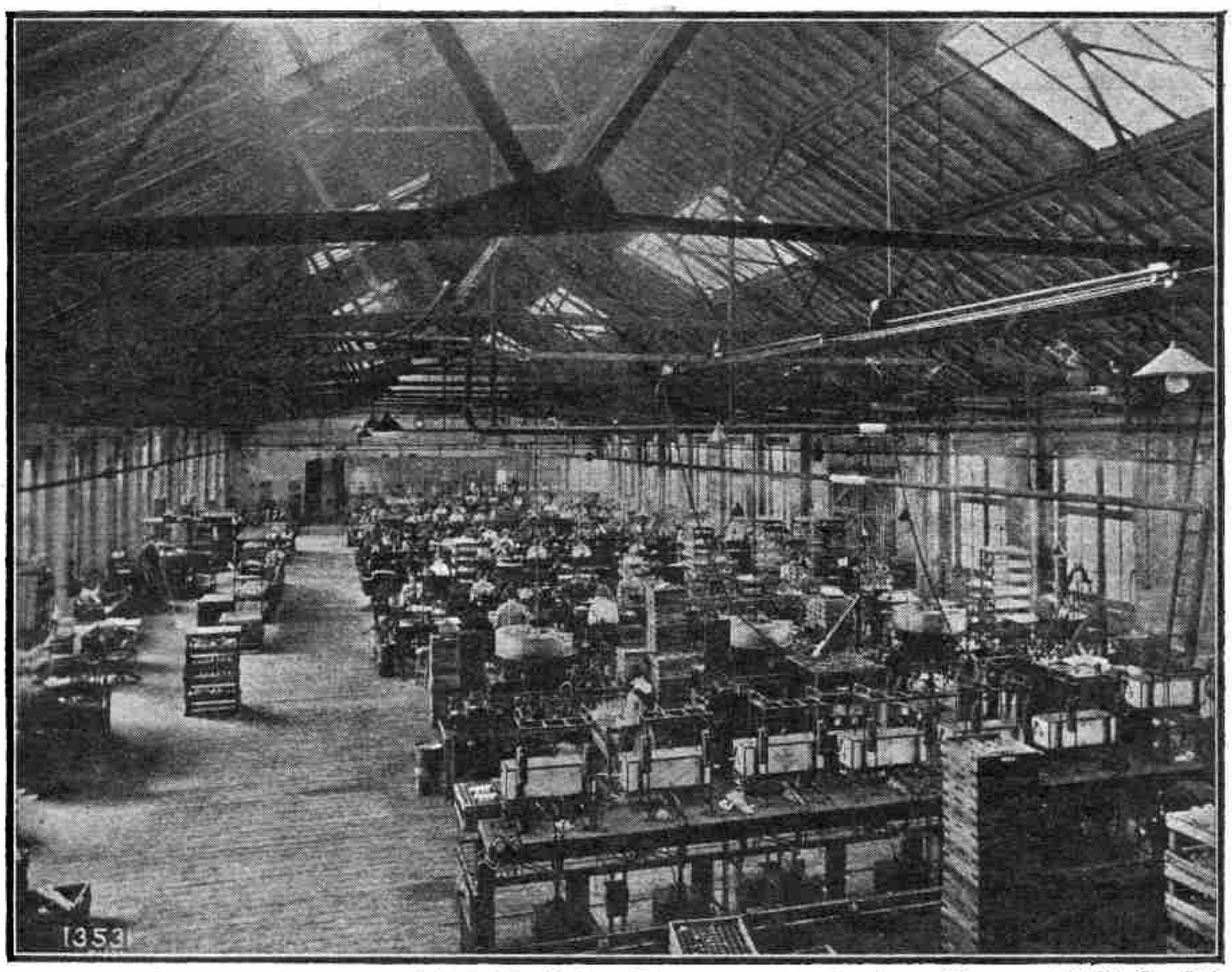


Photo courtesy] **Interior of B.T.H. Valve Department, Rugby** [*Messrs. B.T.H. Co. Ltd.*

Making the Bulb

The first step in the manufacture of the valve is to make the bulb. This is blown from glass tubing by a special machine in which the glass tubing is heated by bunsen-burners. Air-pressure is then applied so that the glass tubing expands, exactly in the same manner as a soap bubble is blown. This gives a large "bubble" of glass, called the "bulb," which is then cut off from the parent tube. One end of the bulb is enlarged slightly so as to take the valve-stem, as that part of the bulb carrying the electrodes is called. This is, of course, introduced at a later stage.

The other end of the bulb is left attached to a few inches of the glass tube, and this remains attached to it through all the subsequent processes until it reaches that in which the valve is exhausted, when the bulb is sealed and the tube nipped off.

Having obtained the bulb the next step is the making of the stem on which are mounted the electrodes, i.e., the filament, anode, and grid. Here again a piece of glass tubing is used, and is heated almost to melting point. At this stage there is introduced to it the four "welds" required for each stem. One weld supports the anode, another the grid, and the two remaining make contact with the ends of the filament.

Why Platinum Wire is Used

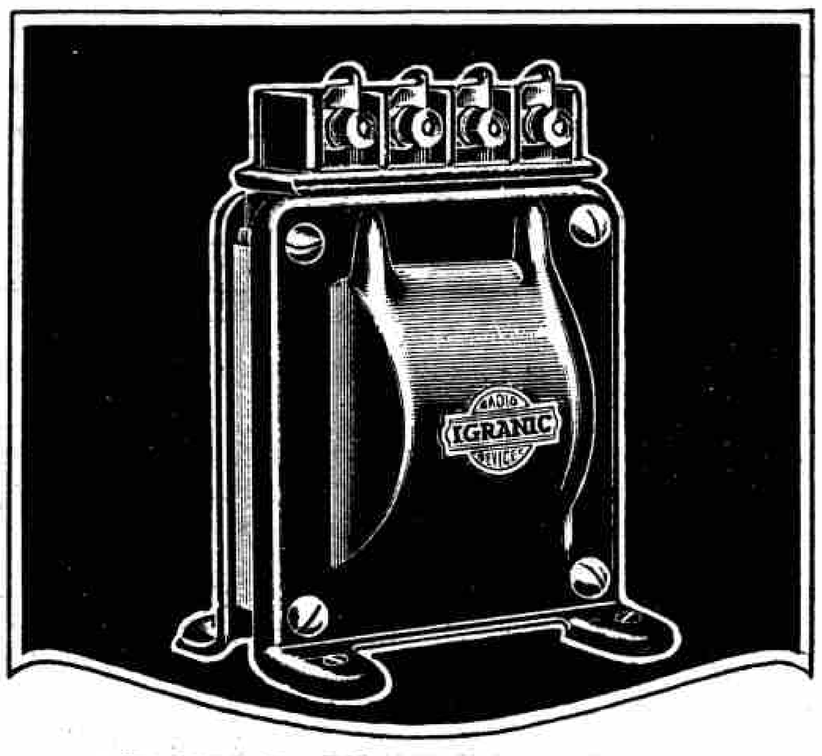
The welds themselves are each made up of three parts. (1) A length of copper wire is used to connect one of the electrodes to the corresponding pin in the plug at the base of the valve. (2) A short piece of platinum wire, or some substitute that expands at the same rate as does glass. It is necessary that the wire used should have the same "expansion coefficient," as it is called, as that of glass, as were it otherwise, when the valve is heated the glass might expand more quickly than the wire, and this would cause the vacuum in the valve to be destroyed. (3) The third part is a piece of nickel wire, and to it the platinum wire is welded, and the copper wire welded at the other end of the platinum wire.

Electrical Welding

It was most interesting to see the wonderful machines employed to weld these wires. The whole process is carried out mechanically, the actual welding being done by a very hot electric spark, which is made to occur at the exact instant required and exactly at the joint of the wires that are to be welded.

Wherever possible the stems for the valves are made on machines. These machines first soften one end of the glass tube and pinch it flat. Meanwhile, the welds are held in such a position that the short pieces of platinum wire become embedded in the pinched glass. The manner in which this work is performed makes one think the machine must almost be gifted with a brain and that it really "thinks" as it does its work.

(*Continued on page* 275



IGRANIC Low-Frequency Transformer

To ensure distortionless amplification—use IGRANIC Transformers

Igranic Low-Frequency Transformers have been designed by a famous Radio Engineer to give high amplification with complete absence of distortion. The special design of laminated core and method of winding the coils, together with extreme accuracy in manufacture, result in the finest Low-Frequency Intervalve Transformer it is possible to produce.

Supplied with steel shrouds to reduce interaction effects, Igranic Transformers are made in ratios of 5 to 1, 3 to 1 and 1 to 1. The last two being suitable for power amplifiers. Their total weight is only twenty ounces. Price : Open, 20/– ; Shrouded, 21/–

IGRANIC ELECTRIC CO. LTD.
149, Queen Victoria St., London, E.C.
Works: - - Elstow Road, Bedford

Glasgow, Manchester, Birmingham, Bradford, Newcastle, Cardiff.

RADIO IGRANIC ELECTRIC Co. Ltd. WINDINGS

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Radio Devices
include
Honeycomb Coils,
Variometers, Vario-Couplers,
Biplug Coilholders,
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Filament Rheostats,
Battery Potentiometers,
Intervalve Transformers,
Vernier Friction Pencils, etc.
Obtainable of all reputable dealers. Write for List Z.221.

NO BOY NEED CONSIDER WIRELESS TOO EXPENSIVE

Renewals on account of defective Cells and Batteries add considerably to your wireless upkeep, but these two "C.W." Specialities will

SAVE YOU POUNDS

on such bills.

THE "C.W." BATTERY TESTER

COMBINED FLASH LAMP BATTERY TESTER AND INSPECTION LAMP. It is usually the H.T. Battery which is at fault when you can't get all the stations you want. This "C.W." Battery Tester enables you to test your batteries and quickly locate the trouble. Pat. No. 218957.

Price **1/6** *each.*
Postage 2d. extra.

BATTERY LINKS

Enable you to make up your own High Tension with Flash Lamp Batteries, so that there is no need to discard a complete H.T. because of a defective cell. "C.W." Battery Links will give and maintain correct voltage, and can also be used as telephone terminal and adaptor. No soldering. Perfect contact owing to automatic Spring Grip. Pat. No. 217141.

Price **10d.** *dozen.*
Postage 2d. extra.

If your dealer cannot supply, write giving us his name and purchase direct from the manufacturers.

DYNAMOS. **Charge your own ACCUMULATORS with a 6 v. 6 amp. DYNAMO complete with CUT-OUT. These machines cost originally £8 - 10 - 0 each. Our special offer of these is 55/– each Carriage Paid. Each machine new and guaranteed.**

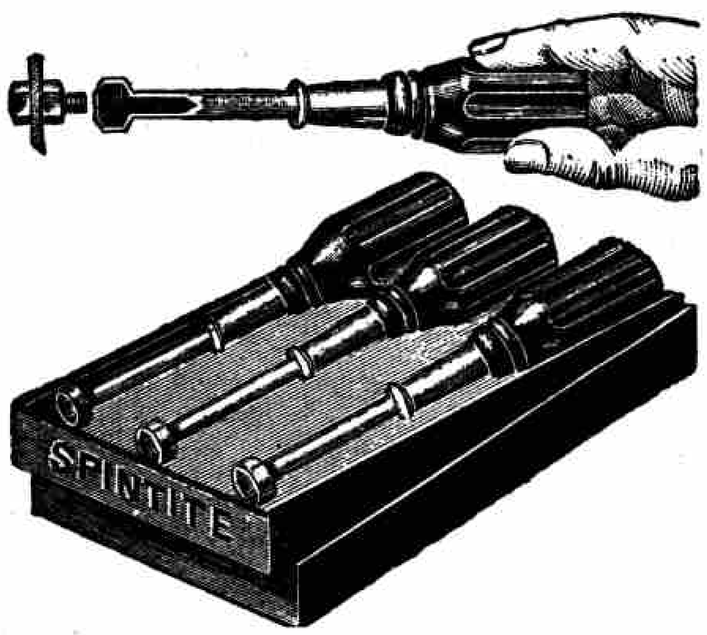
THE JEB TRADING CO.

(Dept. M.), 49a, Avenue Road, Acton, LONDON, W.3.

'SPINTITE' WRENCHES

"The Little Wrench with the Hollow Stem"

For years box spanners and socket wrenches have been manufactured for large nuts, but the small nuts—**so much harder to tighten up with ordinary wrench or pliers**—have never had convenient socket wrenches



SET No. 71

To-day 'SPINTITE' Wrenches enable you to fill that great need for the first time.

The 'SPINTITE' Wrench has a hollow stem so that projecting screws do not interfere with the tightening up of the nuts. The hexagon socket gives a firm grip on the nut.

Set No. 71 consists of three most popular radio sizes for nuts, ¼", 5/16" and 11/32" across flats. Price 5/– per set.

Set No. 73, consists of seven sizes for nuts ranging from 3/16" to ½" across flats. Price 16/– per set.

INVALUABLE FOR MODEL ENGINEERS, RADIO CONSTRUCTORS, MOTOR CYCLISTS, ETC., ETC.

Send P.O.'s to Dept. "M."

ROCKWOOD CO. LTD.

147, Queen Victoria Street, LONDON

How to Photograph BIRDS and their EGGS

By John C. Moore-Hills

IN all bird photography there is one essential quality and that is patience.

It is very often necessary to wait hours before getting a photograph of the bird on the nest, and especially is this the case just before the hen-bird begins sitting. Sometimes you cannot get a photograph of the cock-bird at all. I remember, when photographing a Sparrow-Hawk, that the cock only alighted on the nest once during six weeks, and then he left before we had time to get a plate into the camera!

Plates Preferred to Films

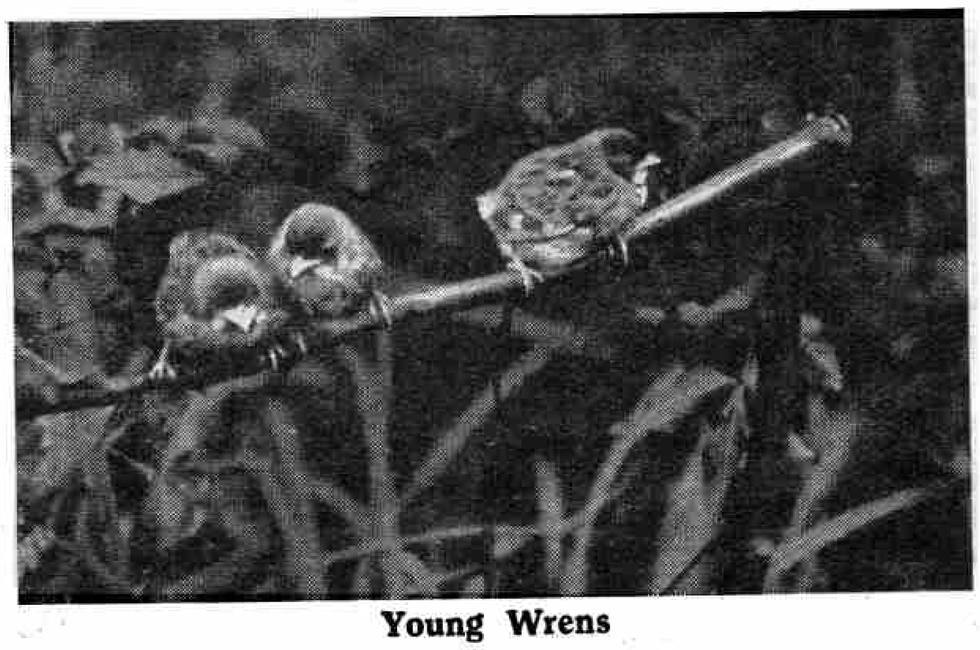
If you intend taking up bird photography, the first thing to do is to choose a suitable camera. In my opinion this should be one in which plates and not roll-films are used. A ¼-plate camera is a good size to begin with, but for more advanced photographers a 5″×4″ or half-plate is better.

Having obtained the camera, the next thing is to find a good nest to photograph. I recommend beginners to try taking some ground-bird first, such as a Lapwing, Yellow-Hammer, Tree-Pipit, or Meadow-Pipit, because nests on the ground are generally more conveniently placed than those in trees or hedges.

Even when a good nest has been found, it is doubtful if the birds will remain. Many of them are so easily frightened, and even the "click" of the shutter will often scare them away. The first thing to do in photographing them, therefore, is to accustom them to your presence near the nest. If you do this very carefully you will find that after a time they will become quite used to you and not take any notice.

Don't Visit the Nest too Often

If you do not accustom the birds to your presence and the appearance of your camera in this way, the birds will in all probability desert the nest and then you will not get any photos. You should allow at least two eggs to be laid before you take the first photograph. It is also very necessary not to keep the hen-bird away from the nest too long, especially when the young are nearly hatched, because if the eggs get very cold the young will die in the shell.



Young Wrens

Do not visit the nest too frequently at first, but take only one or two photographs

Young Green Woodpeckers

of the eggs, for if you keep disturbing the bird she becomes worried and then the eggs are generally a failure.

When the eggs have hatched the interesting part begins, and photographs may be taken every day to show the young at all stages. You may then be able to get photographs of both the cock and hen-birds and of the young being fed.

Photographing Hedge-Nesting Birds

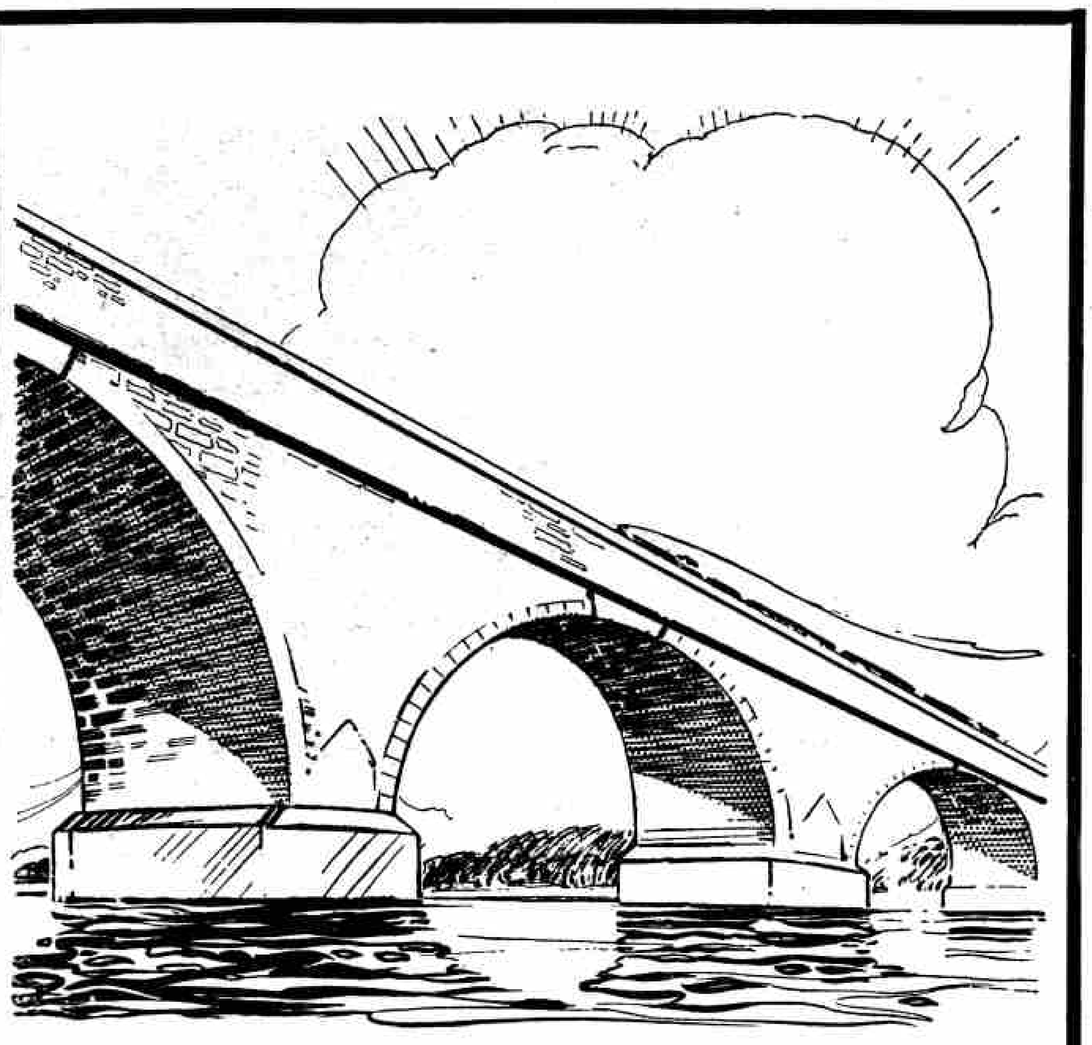
After some experience with ground-nesting birds you can tackle something bigger, either some of the hedge-nesting birds or those that nest in trees. Of the hedge-nesters, perhaps the easiest to photograph are the Hedge-Sparrow, Robin, and Garden Warbler. If you are lucky you may possibly find a Cuckoo's egg in one of these nests, and in such a case you should be careful not to disturb the hen-bird more than you can help because you will be able to get some very interesting photographs and observations.

You should try to find a nest in a hedge which has a ditch running beside it and with plenty of cover round. In this ditch you can build yourself what is called a "hide," or little hut made mostly of boughs and sacking The hide should be constructed so that it is easy for you to get in, without disturbing the birds. When you have made it, cut a small hole in the sacking just large enough for the lens of the camera. Then inside the hut make a small stand for the camera, and having done this you are ready to take the photograph.

Keep a Note-Book

Endeavour to obtain your photographs under different conditions. A good time to see the hen-bird sheltering her young is during a thunder-storm.

(*Continued on page* 261)



Where lies the strength of the bridge?

The strength of the bridge lies in its foundation. Deep down into the bed of the river its piers are laid in solid ground.

You yourself resemble a bridge. You will be called upon to carry your burden of responsibility through life. You will have the storm periods when your foundations will be put to the test.

Your foundations must therefore be laid on the solid rock of good health, and good health is only possible through sound teeth. *Sound* teeth are *clean* teeth!

It is a simple and pleasant matter to keep the teeth in perfect condition by the twice daily use of Gibbs Dentifrice. It cleans and brightens the teeth by removing the greasy food deposits and polishing the millions of tiny waves and facets into which the enamel of a normal tooth is divided.

It is these facets of the enamel (seen only through a powerful magnifying glass) which give the bright, sparkling appearance to clean teeth.

Gibbs Dentifrice is most convenient—a solid cake, protected by an aluminium case—it cannot accidentally spill or squeeze out.

Your chemist can supply you with Gibbs Dentifrice at the following prices: Large size, 1/–; De Luxe, 1/6; Refills, 11d.; Popular size, 7½d.

"The Fortress of Ivory Castles"

FREE! Your little brother or sister will be keenly interested in the Gibbs Fairy Book "THE FORTRESS OF IVORY CASTLES"—a sequel to the famous "Ivory Castle Fairy Book"—an enthralling story comprising 36 beautifully illustrated pages. Sent post free, together with a useful size sample of Gibbs Dentifrice, on receipt of 3d. in stamps to cover cost of packing and postage.

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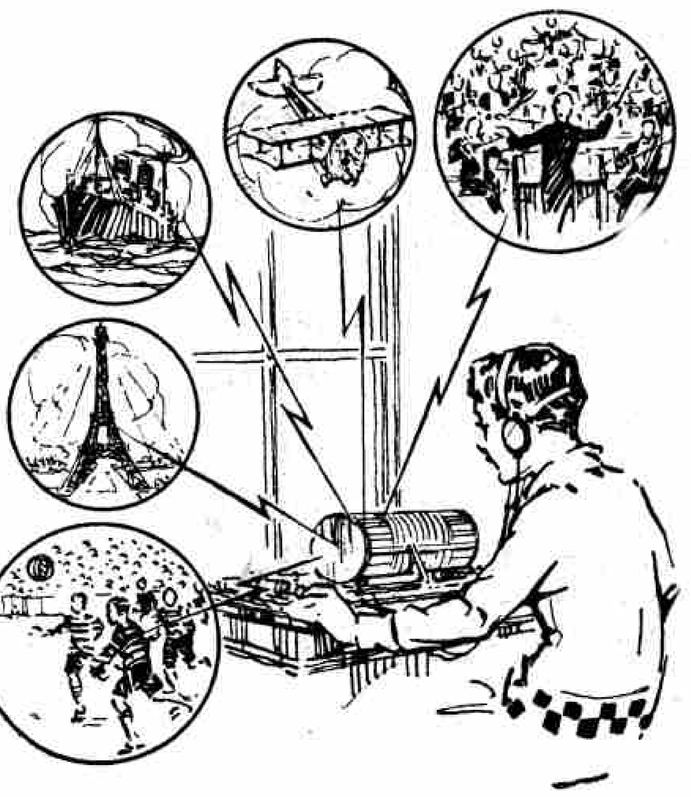
Cold Cream Soap Works, London, E.1.



Listen with a
Meccano Receiver

The Meccano Crystal Receiver No. 1 is a highly-efficient and splendidly-finished instrument. The detector is enclosed in a glass chamber, which effectively protects it from dust and moisture. Two slides are provided, one on each side of the inductance, giving great selectivity and clearness of reception.

The usual range of a crystal receiver for telephony is about 20 miles, but the Meccano Receiver with a good aerial should be effective up to 30 miles, according to local conditions, on which the range at over 15 miles largely depends.

No. 1 RECEIVER

WAVE LENGTHS: Zero to 1,000 metres.
DIMENSIONS OF SET: 9¼ in. × 8¼ in. × 5 in.

R.S.1. (without 'phone) .. PRICE (Post free) **15/9**

The Meccano Crystal Receiver No. 2 is of the constructional type, and is assembled from standard Meccano parts. It is specially adapted to the requirements of those who wish to carry out simple experiments. It may only be used with a constructor's licence, which costs 10/–, and is obtainable from any Post Office.

No. 2 RECEIVER

WAVE LENGTHS: 300—400 metres. (By adding additional inductances the wave length may be increased if desired).

Parts to make the No. 2 Receiver, complete in strong carton, including single 'phone, 2000 ohms resistance .. .. PRICE (Post free) **23/3**

Parts, as above, but without 'phone **15/9**

MECCANO DOUBLE HEADPHONES

British made, 4000 ohms resistance, and of the highest quality procurable, giving loud, clear and undistorted reception. Comfortable to wear and easily adjusted.

PRICE (Postage paid) **15/6**

MECCANO LTD. BINNS ROAD LIVERPOOL

Birds and their Eggs—(*cont. from p.* 259)

Cuckoo's Egg in Nest of Garden Warbler

A friend and I once got some magnificent photographs of a Sparrow-Hawk during a very severe storm. Another good time to take them is on a very hot day when the mother spreads her wing-feathers and tail-feathers out to guard her offspring from the heat of the sun.

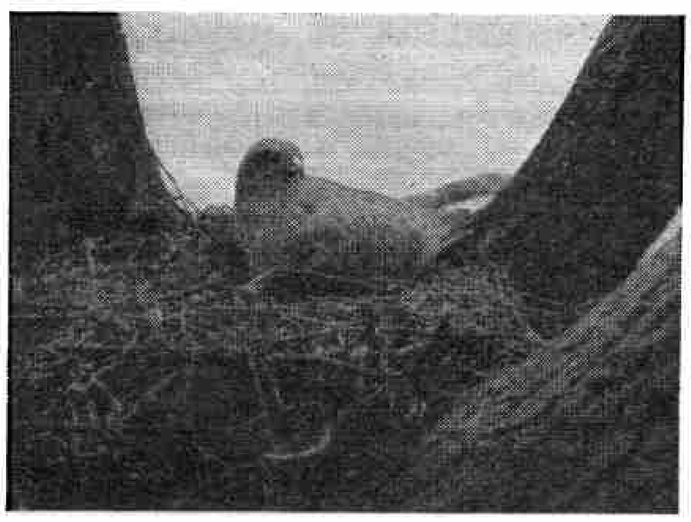
When taking bird photographs it is very interesting and instructive to keep a book containing all your notes of observations of the birds, their call notes, cries when alarmed, and the different kinds of food with which they supply their young. Such notes made by yourself are always much more valuable than anything you read in books.

You can also build hides in trees to photograph Hawks, Owls, Rooks, etc., but you will find these hides much more trouble to build, as they must be made fairly strong and waterproof to withstand wind and rain.

When you wish to find out the habits and peculiarities of any special birds it is best to look out for a pair that are building in a good position for photography, and when they have finished making the nest you can then fix up the camera and, if necessary, the hide. Now is the time to begin making your observations and taking notes of everything they do, the building material used, the length of time taken to complete the nest, the alarm and call notes, and anything that strikes you as interesting or unusual. As time goes on the notes become more interesting, the number of eggs laid, shape, size, peculiar markings, date of hatching, and the different foods brought to the young.

As it may be of interest to some readers, I give below a few extracts taken from my Sparrow-Hawk notes :—

May 7th—Pair of Sparrow-Hawks building in Wood X. Oak tree, nest about 35 feet up. May 15th—Nest finished. Started fixing up hide. May 21st—First egg laid, rather on the smallish side and only slightly blotched with reddish brown. May 26th—Sixth egg laid, all rather light in colour and very slightly marked. Bird a young one and probably laying for first time. June 6th—Hen-bird sitting well. Took one photo. June 10th—One egg ejected, addled. Took one photo. June 14th—Two eggs chipped. Took two photos. June 17th—All youngsters off and doing well. Took five photos. June 18th—Cock-bird brought small field-mice and a baby starling, which the hen tore up and distributed to her offspring. Took six photos.



Sparrow-Hawk on Nest

Nest and Eggs of Yellow Hammer

A photograph of this particular Sparrow-Hawk's nest is shown here, and the bird is shown feeding its young in the photograph embodied in the heading of this article. Readers of the "*M.M.*" will remember that several photographs, and a detailed description of my observations of this bird appeared in No. 9, Vol. VIII (September 1923).

Nest and Eggs of Tree Pipit

Wireless Time-Signals

(*Continued from page* 255)

The chief points of the time code stated in tabular form, are :—

Beginning at :	Signal :	Repeated until :	At :
hrs. mins.		hrs. mins. secs.	hrs. mins. secs.
10 44	. . . . . etc.	10 44 54	10 45 0 one dot
10 46	— . . — . . — . . etc.	10 46 55	10 47 0 ,,
10 48	— . . . . — . . . . etc.	10 48 55	10 49 0 ,,
	End of time-signal	End of time-signal	End of time-signal

As already stated, all these times are Greenwich Mean Time, and during the summer months it will be necessary to add one hour to make them conform with Summer Time.

These time-signals are entirely automatic in action, being controlled by special apparatus at the Observatory in Paris, and connected to Eiffel Tower by underground land-lines. The accuracy of the signals is guaranteed to a fraction of a second, the apparatus being switched on a few moments before the signals are due to begin.

Similar codes are employed by the various other stations transmitting time-signals and, since every ship is always within hearing of at least one station, the captain is able to correct his chronometer every day, instead of once every voyage as previously.

Broadcasting Big Ben

No time-signals for ships are transmitted in this country, but the British Broadcasting Company transmits from all its stations the time on several occasions every day from either Big Ben (guaranteed to two seconds) or from the main clock at Greenwich Observatory. The Big Ben chimes for the quarters begin at 15, 30 and 45 minutes 0 seconds past the hour. The chimes for the hours begin at 59 minutes 38 seconds past, the first stroke of the hour chime beginning at 0 minutes 0 seconds. The Greenwich signals consist of six dots. These represent seconds, and the last is exactly the half-hour.

These time-signals serve many useful purposes, such as correcting turret, tramway, and railway clocks, etc., and it has been remarked that people have been more punctual since the B.B.C. began transmitting these time-signals. Clocks and watches are now put right at least once a day instead of once a week as in the old days, and consequently fewer people miss trains and trams and fewer are late for appointments. This is a great thing to have accomplished, and during the future it will save very many working hours from being wasted.

Correction

A printer's error occurred in our last month's issue. The late Sir Dighton Probyn was born in 1833 and not in 1883 as stated.

Foresight in Photography

We have received from Messrs. Burroughs Wellcome & Co. Ltd. (Snow Hill Buildings, London, E.C.1) a copy of a delightful booklet, "Foresight in Photography." On the cover is a particularly fine reproduction of Commander Wild in the "crow's nest" of Sir E. Shackleton's *Quest*. The original photograph, it is interesting to learn, was developed by tabloid chemicals for which the firm are famous. Among the other illustrations is an interesting and novel presentation of the effects of chromium intensification and of the possibility of subsequent modification by the use of reducers and other methods. The booklet also contains a classification of plates and films according to their development speeds, time tables for development, and much other useful matter. Readers may obtain a copy (post free) by mentioning that they saw this offer in the *Meccano Magazine*.

Stamps for Sale

(*See also page* 270)

FREE. Harding Memorial Stamp and Pictorial Set. Ask for approvals and enclose 1½d. postage. Powell, 73 Bond Road, Surbiton, Surrey.

100 DIFFERENT FREE to genuine collectors asking for approvals and enclosing 2d stamp for postage. 30,000 varieties from ½d. upwards.—Hooper's, 90, Harcourt Avenue, Manor Park, London, E.12.

FREE. 50 Stamps, all different, to approval applicants for my famous sheets, all ½d. each.—Scott, 154, Wellesley Road, Ilford.

50 DIFFERENT Foreign and Colonial, including unused. 6d. Postal Order.—Jackson, 188, Rathgar Road, Rathmines, Dublin.

FREE! 25 Roumanian to those sending postage and asking to see Approval Sheets.—C. Florick, 179, Asylum Road, London, S.E.15.

STAMPS. 60 different free to applicants for approvals. All ½d. each. Send postage.—Cox, 135, Cambridge Road, Seven Kings.

75 STAMPS, 4½d. Montserrat, Soudan, Lourenco Marques, Grenada, etc. 50 Austria, 4d. 50 Hungary, 5d. 50 French Colonials, 1/-. 10 Salvador, 6d. Edwards, 43, Edmund Street, Camberwell.

"THE PHILATELIC MAGAZINE."—The best stamp newspaper, only costs 3d. a fortnight from your newsagent. Specimen free to all mentioning "*M.M.*"—Harris, 46, Victoria Street, S.W.1.

THE "DIAMOND" PACKET
contains **1000 UNSORTED STAMPS** from Convents abroad. 1/3 post free. 2 pkts., 2/5; 3 pkts., 3/6; 4 pkts., 4/6; 5 pkts., 5/6.
Nerush, Importer (Dept. E), **2-22, Cathcart Hill, London, N.19.**

STAMPS. Dispersing Collection 22,000 (also Collection entire £1 and £25). Approvals 8d. and 9d. in 1/- discount, cash, or exchange Meccanos or anything useful.—"Olivet," Stretton Road, Addiscombe.

BARGAIN PACKET FOR 1/-, postage 1½d., including Abyssinia, cat. 1/-; Transvaal 2/6 unused; Salvador, cat. 6d.; 2 Nicaragua, cat. 10/-; Norway, cat. 1/-.—C. Lewis, 26, Lichfield Road, Cricklewood, London.

Duplicates sent on approval at 8d. and 1/4 for 50. Also few Colonials priced singly.—H. H. Woodruff, 9, Burgoyne Road, Harringay, N.4.

STAMPS. Large number mint and used British Colonials, also Persian and other foreign at bargain prices. Selections choice copies, priced separately, on approval.—Collector, 31, Kensington Gardens, Bath.

STAMPS. Write for Book of 500 varieties to select from at ½d. each.—Theobald, 54, Antil Road, N.15.

FREE. 30, including 1 Krone Denmark, 1 Gulden Holland. To applicants for approvals from ½d. each.—Betts, 49, Durham Road, Wimbledon.

NONE FREE—NONE AS CHEAP!! Farthing Stamp Approvals; about 1000 sent.—J. V. Wyk, 439, City Road, Old Trafford.

FREE. Packet of MINT Stamps and packet of Mounts to all applicants for my approvals. Special discount.—C. Negus, Bury, Huntingdon.

SET OF 8 TRAVANCORE FREE to applicants for approvals. Try my ½d. Booklets.—S. Huckle, 53, Birkenhead Avenue, Kingston-on-Thames.

FREE!

5 Dutch Indies different to every applicant for approvals at ½d. per stamp, real good value; or for 1,000 Superior Assorted 1/-.—Gall, 37, The Avenue, Durham.

MINT BRITISH EMPIRE

BERMUDA, Ship Design, ½d. green, Script ...	1d.
BRUNEI, Scripts, 2 c. red-brown, 1d; 3 c. green, 1½d.; 4 c. mauve, 2d.; 6 c. black, 3d.; 12 c. ultramarine	6d.
NEW ZEALAND, K.G., ½d. yellow-green ...	1d.

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FINE PICTURE STAMPS,

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To all who send for sheets of same (enclosing postage). You make a profit on any you sell.
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TRUTH IN ADVERTISING.

We have the real thing, no foreign goods, or foreign workmanship. Powerful Table Light, ready for use, only 4/-. Cupboard Lighting Set, 2/6. Steam Engines, 7/6. Dynamos, 7/6. Electric Motors, 5/9. Luminous Paint, 2/9. Bell Sets, 5/6. List free.
A. W. NORTH, 47, Parchment Street, Winchester.

N NORRISCO BARGAINS B

100 diff. SCANDINAVIA (Cat. 10/-) only 1/6. Postage extra.

A small supply of similar packets was previously offered but quickly exhausted, and we were unable to renew stocks at that time. We have, however, just made another fortunate purchase and are passing the benefit on to our customers. The packet is of excellent quality, and contains stamps of NORWAY, SWEDEN and DENMARK only, with values to 1-kr. and including many out-of-the-way items.

SATISFACTION GUARANTEED ALWAYS OR CASH REFUNDED.

Other splendid packet offers :—

500 different stamps	2/-	100 diff. **British Cols.**	1/-
1000 " "	6/-	500 " " "	18/6
100 diff. **French Cols.**	1/9	1000 " " "	85/-
500 " " "	30/-	3000 " " "	£60

Our illustrated lists will surely interest you and may be had FREE for the asking.
NORRIS & CO. (Dept. M.M.), LEABROOKS, ALFRETON, Derbyshire, England.

START THE SEASON WELL!

Packet of 500 different stamps, none after 1914, no better value anywhere, only 3/-; cheap long sets; all different, 10 Bolivia, 3d.; 10 Dominican Republic, 3d.; 10 Barbadoes, 6d.; 20 China, 4d.; 20 Argentine, 5d.; 10 Mexico, 2d.; 25 Mexico, 6d.; 50 Brit. Cols., 6d. Postage extra, but purchasers of any of above also asking to see approval sheets receive 10 Zoological Stamps FREE.
C. F. HENCHER, "Ruxley," Chilworth, Guildford.

15/- WORTH CHOICE STAMPS FOR 3d.

50 varieties, many unused, **Danzig,** grand lot **Austrian** 1908/23, **Magyar,** scarce **Ukraine** on **Russian** Rbl., fine **Poland** choice German Set 5 **Air Post,** Superb **Munich,** Slesvig, etc. Bargain, post free 4½d., abroad 6d.

15/- 3D.

Nelson T. Hillier, The Stamp Mart, Horsmonden.

'The Incomparable Stamp Packet.'

1000 well-mixed Foreign, 20 Colonials, 10 Philippines and 20 Mint, all different. The lot post free 1/3 (abroad 1/6). Collectors' duplicates purchased or exchanged in any quantity. Address—

S. F. BICKERS,
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MINT NEW ISSUES.

Fiji script, 3d. blue, 4½d.; Gibraltar scripts, 1½d., 2½d., 6d., 7d., new shades; Nauru Pict., ½d., 1d. mint, pair 2½d.; Sierra Leone, script, 1d. purple, 1½d.; Southern Rhodesia, ½d., 1d. mint, pair 2½d.; Brazil, 1924, in 4 colours, 200R., 3d.; France Pasteur 75c., 4d.; Sower 85c., 5d.; Azores P. Dues, new values, set of 6, 9d. Postage extra under 2/6.

G. GALLOWAY, N.R.P.,
25, Carisbrooke Road., St. Leonards-on-Sea.

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All different, 70 for 4d., 100 for 7d., and 200 for 1/3. Well-assorted mixture, 500 for 4d. Germany, mint, all different, 12 for 3d. All post free. Belgian unused railway stamp to applicants for approvals (6d. in the 1/- discount).
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25 Holland ...	6d.	40 Bavaria ...	9d.
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50 Czecho-Slov.	1/-	500 Revenue ...	5/-
50 Roumania...	1/-	1000 Revenue	17/6

Postage Extra.

Fine selections ready in separate countries.

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This packet is printed to sell at 10s. and contains many "hard-to-get" sets high-class pictorials, and odd values, catalogued 1d. to 7s. 6d. each. Given free to all requesting approval books and sending 4½d. to cover cost of postage, packing, etc. (abroad 9d.).

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stamps FREE to all remitting 1/- or more for purchases from our famous approval sheets. Gift to all applicants. Liberal Discount Given. Try also our EMPIRE Packet of 24, including Morocco Agencies, Kenya, new Egyptian, Straits Settlements and Exhibition issue, 9d.

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7. MOSTYN AVENUE, WEMBLEY.

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We send out approval selections suitable for any class of collector, but our Classes A and B are specially for the beginner and junior collector.

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Over 1000 different Foreign and 500 different British Colonials are included in this series.

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25% Discount on purchases of 2/6 or over.

Ask for a selection of your favourite country. 1925 Price List now ready Abridged List (16pp) Post Free. Complete List (50pp) 3d.

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55 DIFFERENT, including **Nauru,** Phosphate Steamer mint; **Sudan,** camel, small; **Sudan,** camel, large; **Abyssinia,** zoological; 2 **France, Pasteur; German East Africa,** Yacht Hohenzollern; **Holland Jubilee,** large; **Iceland;** 3 **Cuba;** 2 **Siam** and 2 **Triangular Austrian** Express Stamps. **55** different for **10d.** post free.

500 different, used and mint, mostly European, wonderful value, **1/3** post free.

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100 different used and unused, including rare imperfs., cat. many times my price. Only a limited number available. **The 10th order received will have a pair of stamps (cat. 30/-) added quite free.**
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OPEN TO ALL COLLECTORS

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Twenty Prizes value £1-1-0 to 5/- and 50 Consolation Prizes. An equal chance for all competitors.

Approval Selections of cheap stamps, with large discounts, sent on application. State countries in which you are interested.

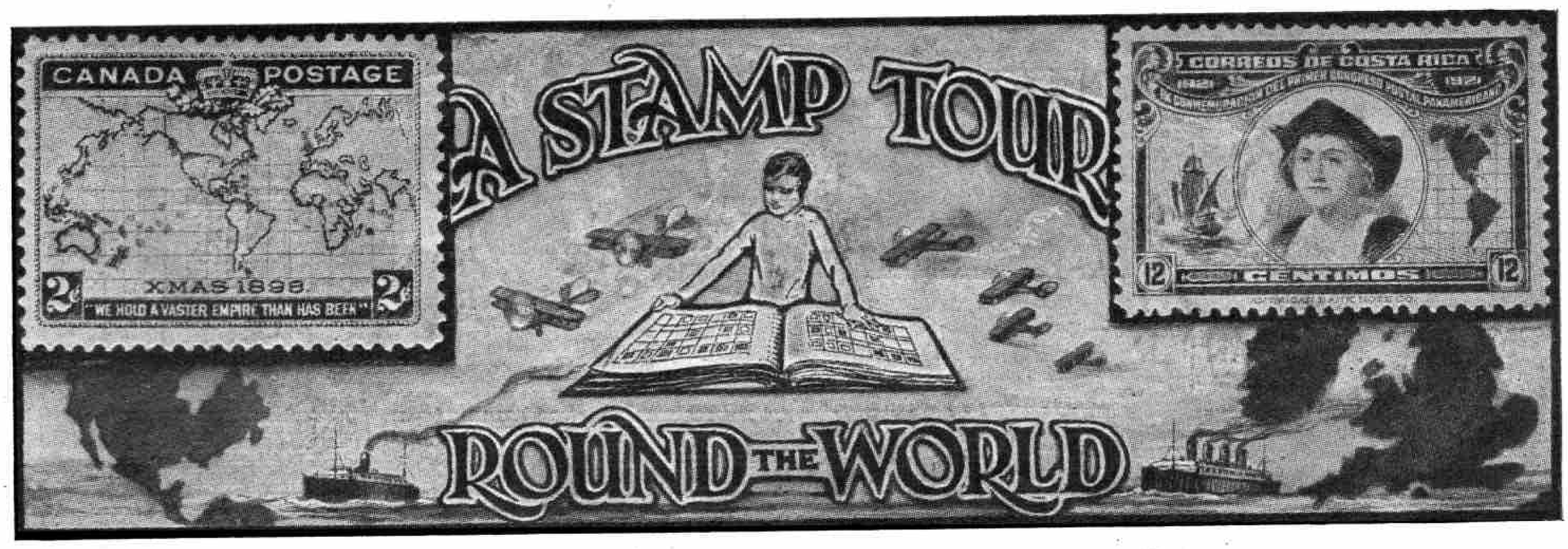
PERCY DUNBAR,
19a, Barnard Road, Clapham Junction, S.W.11.

(*Continued on page* 270)

FREE!! **STAMP COLLECTOR'S OUTFIT AND 60 DIFFERENT STAMPS** **FREE!!**

This Tremendous Advertising offer contains all the following :—60 different stamps (25 unused), including British Colonials, Indian Native State, Victoria (rare old Q.V.), East Africa and Uganda, Cuba, New South Wales (long obsolete), interesting Philippine Isles (mint), Gwalior on India, U.S.A. (pict.), Peru (scarce), Wurtemberg (unused imperf.), Russia, Polish Republic, many War and Armistice. A truly fine collection of stamps! The Outfit contains pkt. peelable hinges, and a unique novelty that all collectors should have, a combination pocket folder, and a mathematically-correct perforation gauge. The whole lot sent absolutely free to all genuine approval applicants.

SEND POSTCARD ONLY TO:—LISBURN & TOWNSEND, 201a, London Road, LIVERPOOL. **Collections Purchased.**



I. INTRODUCTION

I FEEL sure that Meccano boys would be glad of the chance of making a tour round the world, in company with a stamp-collecting friend to guide them and point out the wonders encountered on such a journey. The longing to travel, to visit foreign places, to hear foreign speech, and to see the famous buildings and engineering wonders of the world is with us all, irrespective of age or occupation.

A Magic Carpet

Unfortunately most Meccano boys cannot satisfy this wish, but as stamp collectors they have something equivalent to the Magic Carpet that carried its lucky owner anywhere he wanted to go. In our albums we find pictures of all kinds of strange and beautiful scenes. We learn to know one foreign language from another. We see pictures of the people of all lands in their native dress. We acquire knowledge of the famous people and the famous things of many countries. Kings, Presidents, heroes, national emblems, national products, historical scenes—all are recorded on the stamps in our albums.

By means of stamps we may make an imaginary tour of the world, and in this series of articles I invite all stamp collectors to make such a tour with me. In this tour we shall visit only those places that at some time or other have appeared on a postage stamp.

It must be remembered that we are making not merely a journey round the world, but a tour. The difference between these two words is enormous. The former merely implies travelling round the world in the shortest possible space of time, as in Jules Verne's fascinating story "*Round the World in Eighty Days*" (which I hope you will all read if ever you have the opportunity to do so), while a tour means that the journey will be other than direct, and that we shall see many places that would be missed altogether if we were to rush round the world as fast as road, sea, or air could take us.

Liner and Aeroplanes

In our tour we shall travel by a liner specially chartered for us (regardless of expense!) and placed entirely at our disposal throughout the journey, so that we may be free to go anywhere at our own pace. When we wish to visit some inland place we shall be fortunate enough to be able to use a large fleet of aeroplanes, which have been arranged for in advance. On completing our inland visits we shall always return to our ship, which will be awaiting us at an appointed spot.

This imaginary tour will be made by means of stamps illustrating the many places we shall visit. Consequently, the reader-traveller will find it useful to have his stamp catalogue and album before him when he is taking this tour, for we shall not have sufficient space to show by stamps all the places that will concern us.

The Start

The tour starts from the Meccano Works in Liverpool, where there is an eager throng of readers, all ready to go on the stamp tour. Many of the travellers have brought their Meccano Outfits with them, intending to build models of the engineering wonders seen on the tour.

After we have said "Good-bye" to Mr. Hornby and to the Editor of the "*M.M.*," we board the fleet of special motor cars waiting for us and drive down to the Pier Head. On our way we see St. George's Hall and pass through Church Street and Lord Street, the busiest streets in Liverpool. From the landing stage we obtain a magnificent view of the world-famous Liver Building, with its wonderful tower and largest electric clock in the world. Boarding the waiting liner at St. George's Landing Stage (itself a wonderful achievement of engineering) we soon see the last mooring rope cast-off, to allow half-a-dozen tugs to turn the great liner in the river so that we shall face the sea. . . . Now we are under way—we have a voyage of two thousand miles before we reach our first stop, St. John's, Newfoundland.

(To be continued)

Control Numbers

At some time or other, every stamp collector has seen the letter and number that appear in the margin of sheets of stamps. These are called "control numbers," and their purpose is to enable the Post Office officials to know to which printing a certain sheet of stamps belongs. To make this possible each different printing must, of course, have a different control number or letter, that has not been used before.

Some years ago the control numbers appeared in various positions, although they always have been in the margin under one or other of the stamps forming the bottom row of the sheet. Recently, the control numbers have been under the second stamp from the left on the bottom row of stamps.

Fig. 2

Stamps are not printed every day, as might be expected. Most values are printed three times a year in sufficient quantities to serve until the next printing. Some stamps that are little used (the 7d. value for example) are printed less frequently, the stock obtained from a single printing lasting sometimes as long as twelve months.

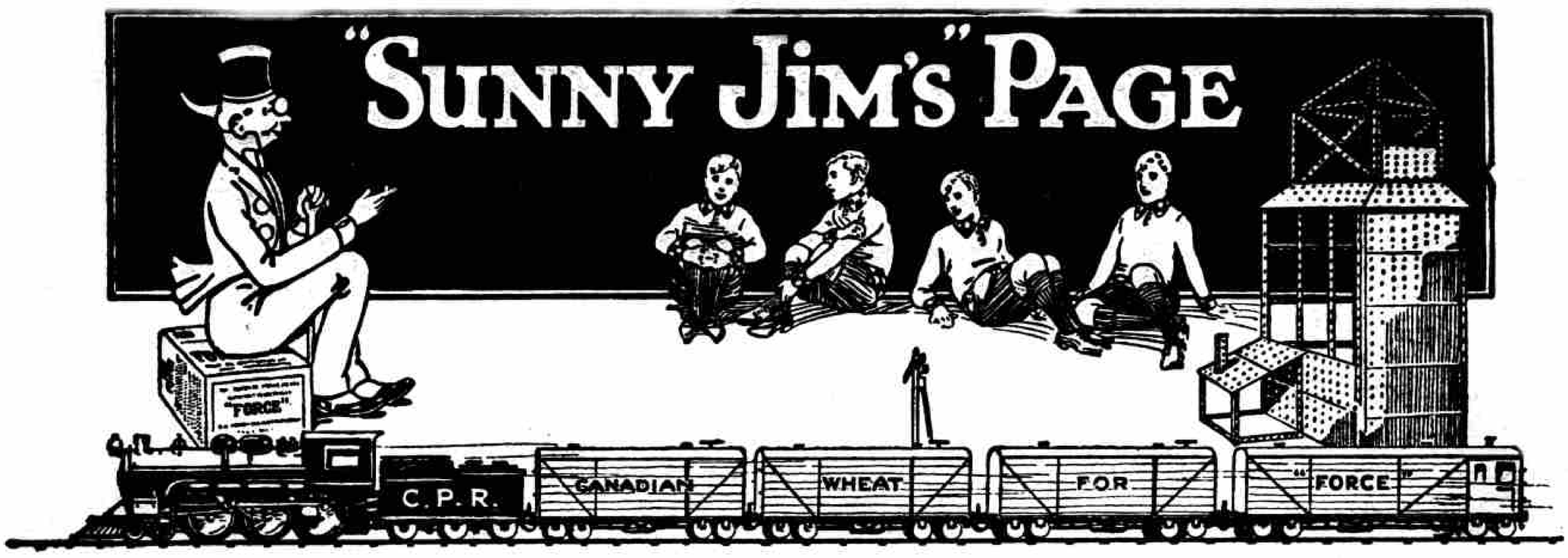
Early Controls

The first controls were those of 1887, and this printing had the letter "A" on the bottom margin of the sheet. With each succeeding printing the next letter of the alphabet was used, so that the second printing was lettered "B," the third "C," until "R" was reached by the ½d. stamps and "X" by the 1d. stamps. These were the two letters in use at the end of Queen Victoria's reign.

Fig. 1

With the accession of King Edward the controls re-commenced at "A." In 1904 an important addition was made in the form of a number, to indicate

(Continued on page 275)



The Football Season's Here!

Sunny Jim gives some Hints on Play

Once more King Cricket gives place to the monarch of Winter sport, King Football, and all you boys, I'm sure, are looking forward with keen anticipation to the joyous days ahead. Great days of healthy tussles on the football field.

"Phip-p-p" goes the whistle, and away down the field goes the forward line—but stay, let us now get down to the practical business of overhauling our kit and tuning ourselves up with a view to improving our game.

Now you, reader, where do you want to play—forward, half, back or goal? Let us see what the qualifications are for some of these places on the field.

Dribbling, passing, shooting, and dodging are the four important assets of the good centre-forward. Learn to keep the ball at your toe, to control it at speed. Practise with a rubber ball when by yourself and determine to master it. When the opportunity comes to make a good pass, do not let proficiency at dribbling make you selfish. Learn to shoot with either foot, for it is the centre-forward who receives the passes from the wing men, and who must place the ball with speed and precision into the mouth of the goal.

The half-back aspirant must be prepared to combine the qualities of both the forwards and the full-backs. He has both an offensive and defensive game to play. He will play in close co-operation with the forward line, it is up to him to keep the game in the enemy's territory. Learn to kick hard and true. Never keep the ball for long—your play is to feed the forwards. Learn to tackle fearlessly. It is the half-backs who are the first line of defence when the enemy presses.

Good tackling is the greatest asset a full-back can have. He only is between the ball and the goal when the opposing forwards rush in. A poor tackle and the goalkeeper is undefended and the goal in danger. Clear the ball with accurate kicking. Determine where to send it and see it goes there. Hard kicking at random is often worse than useless; it may give the ball to a back or half-back of the opposing side. Heading, too, is a necessary qualification for a full-back. Catch the ball on the forehead so that you can direct it. It is, of course, useless simply to let it bounce on to your head and off again.

Wherever you elect to play always remember that the team spirit is the thing. A side that pulls together always does well.

Learn thoroughly to play the game you choose, but, be it forward, half, back or goal, remember that merely knowing *what* to do isn't everything. You must *be able to do it.* To play as hard a game after half-time as before it you must be strong and healthy. Set to work now to build up health and strength by asking your people to let you have a good wholesome whole-wheat food. "FORCE" is the food you should eat, because it is actually whole wheat grains, steam-cooked and malted for easy digestion, then rolled and toasted crunchy crisp for wonderful nutty flavour. "FORCE" doesn't need any cooking. It is ready to eat with hot or cold milk according to your fancy. You'll like "FORCE" so much that you'll want it for breakfast and supper every day—you'll tell all your chums about it. Send now for a free sample packet and get to know this fine health-giving food that is so good for everyone. Begin to build strong virile muscles that will be of real service to you, not only on the football field, but in all walks of life.

Sunny Jim

FORCE
WHOLE WHEAT FLAKES
MALTED AND TOASTED

FORCE
WHOLE WHEAT FLAKES
MALTED AND TOASTED

POST THIS FREE COUPON
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Name
Address

Fireside Fun

THE Esau Wood "Tongue-twister" last month seems to have had a quietening effect upon most of those young people who during the past month or two have delighted in bombarding a harassed Editor with terrible "twisters!" This month, therefore, we are having a rest from "tongue-twisters"—indeed, there have been so few "retaliations" to Esau Wood that I am managing to take a short holiday, and "tongue-twisters" will speedily be forgotten amid the Yorkshire moors! There I shall have an opportunity of thinking out some new schemes for the amusement of "*M.M.*" readers. I advise you all to look out for further announcements and surprises, for I feel sure this page will cause more "brain-puzzling" and much laughter around thousands of fire-sides during the coming months.

* * * *

Puzzle No. 31.

The name of a flower is hidden in each of the following sentences, the letters occurring consecutively in the correct order.

1. Shall I put this stamp in Kate's album?
2. What lovely hair! I should like mine to curl like it.
3. If that man is insane, money should not be given to him.
4. My cousin Ada is your sister-in-law.
5. My brother has travelled in Japan, Syria and India.
6. Will Mr. Carlo be liable for this damage?
7. Do you hear how Tom and Sarah are bellowing in the nursery?
8. I read to that poor negro several times a week.
9. This case is urgent. I anticipate serious results.

(Contributed by William Wilson, Edinburgh, to whom 2/6 has been sent.)

* * * *

A profiteer bought a luxurious country home and set about making it even more luxurious. Money, of course, was no object. One of his plans was to have a fishpond containing eels.

"But you can't keep eels in a pond," protested his neighbour, to whom he had confided his idea. "They have to go down to the sea every year, you know."

"Well, I won't have 'em, then!" exclaimed the profiteer. "I always takes the missus and the kids every year, but I ain't going to take no eels!"

This Month's Short Story

Boy. Gun.
Joy. Fun.
Gun bust.
Boy dust.

* * * *

Puzzle No. 32.

Arithmetic puzzles seem to appeal to a large number of our readers, judging by the letters I have received recently. Here is another good one:

A lady went to a bazaar with a sum of money in her purse. She paid 1d. entrance fee, then spent half of what she had. She next spent 2d. for the concert, and spent half of what she had left on chocolates. Going through to the next room she paid another 2d., then spent half of her remaining money. Finally she paid 2d. for a lucky "dip" in the last room, and there spent half of what she had left on a bunch of violets. Going home she found she had only one penny left. How much money had she when she started from home?

(Contributed by M. Ward, East Ardsley, Nr. Wakefield, to whom 2/6 has been awarded).

* * * *

An inmate of a mental hospital sat holding a stick, with a piece of string attached, over a flower bed. A visitor approached, and wishing to be affable, asked:

"How many have you caught?"

"You're the fourth!" was the unexpected reply.

* * * *

White: "Hello! Black, are you off to the North Pole?"

Black: "No, I'm going to paint the front door."

White: "Then why are you wearing all those coats?"

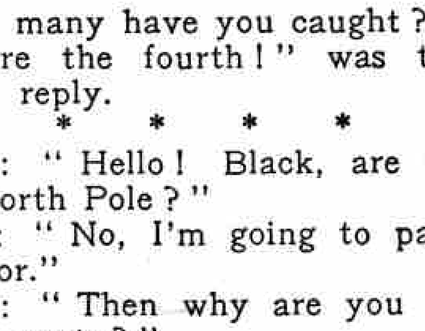
Black: "Well, it says on the tin: *To obtain first-class results, put on three or four coats!*"

(Contributed by Frederick Wright, 34, Upperthorpe Road, Sheffield).

* * * *

Puzzle No. 33.

A lady brought to a jeweller a chain which was broken into five pieces and asked him to mend it for her, promising to pay him 1/– for every link that he had to break and weld. When it was finished



she was surprised to receive an account for only 3/–. How did the jeweller manage to mend the chain by breaking only three links?

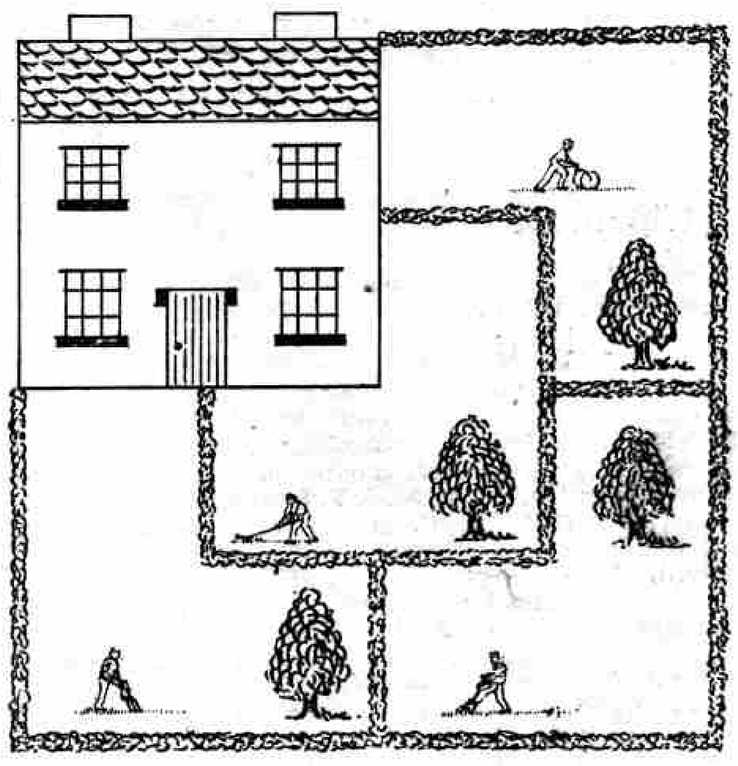
(Contributed by Ronald Storey, Scarborough, to whom the monthly prize of 5/- has been awarded).

Answers to last Month's Puzzles

No. 28. 72 Leaps.

* * * *

No. 29. Below is shown how the four sons carried out the conditions of their father's will, taking an equal portion of his land so divided that each son had a piece exactly equal in size and shape and each containing one tree.



No. 30. 12 Seconds. There are five intervals between strokes of one and one-fifth seconds each when six is struck. There are ten intervals of one and one-fifth seconds each when eleven is struck.

We offer a prize of 5/– for the best puzzle submitted each month, and four prizes of 2/6 each for any other puzzles printed.

Puzzles should be expressed as clearly as possible and the answers should be given in each case. Diagrams should be clearly drawn and letters should be addressed "Puzzles," Meccano Magazine, Binns Road, Liverpool.

We hope to announce next month a special Puzzle Competition for Guild Members.

A mournful-looking gentleman was bewailing the fact that he had no friends. "I have only one friend in the world—my dog!" he proclaimed.

"Why don't you get another dog?" asked a cheery optimist.

* * * *

A gilded youth, tiring of life in an office, decided to go to sea. He managed to get a job as a stoker on an Atlantic liner. Having signed on, he went aboard, and was ordered below. Three days later in mid-ocean, he was found, in resplendent garb, conversing with a young lady on the promenade deck. In answer to the irate officer's remarks the gilded one replied pleasantly, "*Oh, haven't you heard? I've left!*"

Competition Corner

Result of Second "Lynx-Eyed" Contest

Judging from the numerous entries received in this competition, it is apparently quite impossible to really puzzle Meccano boys. In spite of the fact that we spent many hours making up the most difficult and tricky puzzle-pictures from the Meccano Manual, 32 competitors succeeded in solving all the pictures.

This competition has been by far the most difficult yet announced, and the 32 successful entrants fully deserve the title of "Lynx-Eyed" readers, as well as the congratulations of their fellow competitors.

In accordance with the rules governing a tie, neatness of writing was taken into consideration in awarding the prizes. Also, in order that every successful entrant should receive a prize, the number of consolation prizes has been increased to 28, and a special fourth prize awarded to the youngest competitor sending in the neatest entry. The list of prize-winners is as follows:—

FIRST PRIZE (Hornby No. 2 Tank Loco):—
J. H. KETTLE, of Barrow-on-Soar, Loughborough.

SECOND PRIZE (No. 1 Radio Receiver):—
L. WELLAND, of Thames Ditton, Surrey.

THIRD PRIZE (Meccano Double Headphones):—
P. T. BOURNE, of Rotton Park, Birmingham.

SPECIAL FOURTH PRIZE (Meccano Clockwork Motor):—R. PHILP (age 10), of Chesham, Bucks.

CONSOLATION PRIZES to the following Competitors:—E. Aspinall (Wallasey), N. F. Beckett (Bromley, Kent), L. Chilvers (Norwich), C. Clark (Bletchley), D. Clement (Pontesbury, Salop.), S. Collier (Manchester), W. R. Croft (Pontesbury, Salop.), C. G. Emmett (London, W.14), M. S. T. Fowler (Teddington), P. Gardiner (Bristol), E. H. Glover (London, N.5), R. H. Herbert (Wallasey), G. W. Hook (Honiton, Devon), J. Jennings (Dublin), J. Kemp (London, N.W.10), D. MacLean (Chasetown), W. Manning (Purleigh, Essex), G. S. Marsh (Thornton-le-Fylde), J. T. Milnes (Cawthorne), T. J. Mullins (Birkenhead), D. Porter (Cheltenham), W. Selby (Chard), D. Schofield (Lincoln), S. H. Simons (Barking), T. W. Tugwell (Tunbridge Wells), N. Ward (East Ardsley), J. Wilkinson (Ardsley), G. H. Williams (London, S.W.15).

The correct solutions to the three sets of Puzzle-Pictures will be given in the November issue of the "*M.M.*" It is impossible to publish the answers before that number, as the Overseas Section of the competition does not close until 31st October, 1924.

We shall announce another of these popular competitions in the near future. We hope that all competitors who have not been fortunate enough to win a prize in this contest will enter and have better luck next time.

Result of Eighth Photo Competition

A large number of the entries in this competition were holiday snaps, and it seems evident that picnics, bathing, sailing and camping have been occupying the attention of many readers during the last few weeks. Some beautiful photographs of country roads, lakes and woods were also entered, and in these a high pictorial standard was shown.

There were two prizes offered in each section, i.e., Meccano goods to the value of 10/6 and 5/- respectively, to be chosen by the winner from the current catalogue. The First Prize in Section A (under 14 years of age) has been won by L. E. Ashforth, of Birmingham, for a very fine river scene, and the Second Prize by Denis Salt, of Shrewsbury, for his clever snap of the Bumping Races at Shrewsbury School.

In Section B (14 years and over) E. Muir, of Birkenhead, wins the First Prize with a study of a country lane, which is exceptionally clear in detail. For his snap entitled "Summer in the Woods" Bryan Pearson, of Lye, Stourbridge, has been awarded the Second Prize in this contest. We hope to see more entries by these clever photographers in future competitions.

New Contest for Meccano Cyclists

As there are evidently very many enthusiastic cyclists among readers of the "*M.M.*," it has been decided to announce another cycling essay competition. The essays received in the last contest were of a very high standard, and entrants in the new competition should not find any difficulty in describing their "Most Enjoyable Cycle Outing," which is to be the subject.

Nearly every cyclist has happy memories of some particular ride which he enjoyed more than any other. This run may perhaps have been into the country, down to the sea, or even into a local town. A few moments' thought will soon recall the details of that most enjoyable trip, and as the essay may run to 500 words there will be quite sufficient space to do full justice to the subject.

The entries in this competition will be judged by "Rover," and the prize offered is a supply of puncture-sealing solution sufficient for two tyres, to be chosen by the winner from an advertiser in the "*M.M.*" Entries should be plainly written in ink on one side of the paper only, and each sheet must bear the competitor's name and address on the back. Envelopes should be marked "Cycling" in the top left-hand corner and should reach this office before 30th September.

FOR
OVERSEAS READERS

Result of Essay Contest

The choice of Overseas Stamp Collectors showed a considerably wider range than that of Home Competitors in a similar competition. Although many well-considered and neatly-written entries were received, no two entrants dealt with the same sets. The prize of stamps to the value of 10s. 6d. is awarded to Master Allan Watson, of Pretoria, South Africa, who very naturally chose the South African stamps as the subject of his essay. His description of the various issues of Transvaal, Cape, Natal and Orange River Colony was particularly good, and he is obviously an enthusiastic collector.

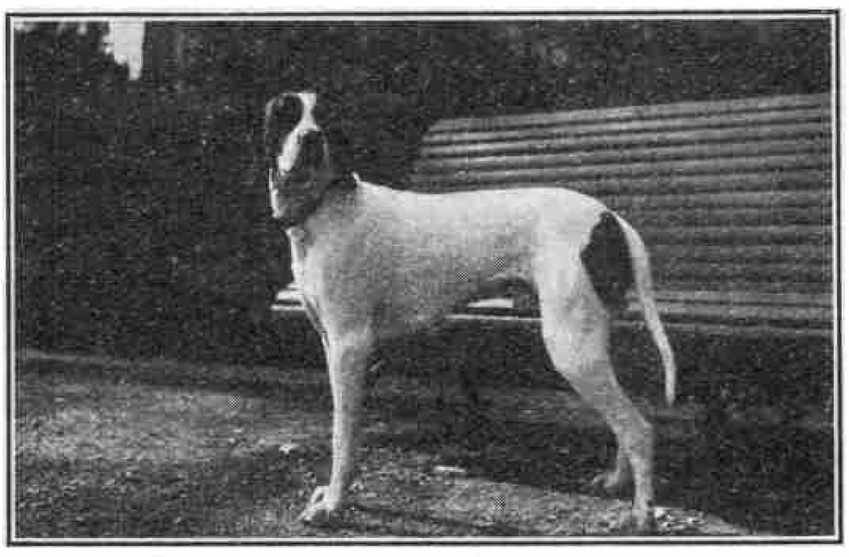
An essay deserving special mention was entered by Master E. A. Mutelholzer, of British Guiana, whose favourite stamps were five of the British Guiana Jubilee.

Result of Seventh Photo Competition

An outdoor scene was the subject of this contest, and the wide scope it afforded attracted numerous entries from all over the world. Among the many interesting scenes portrayed were snaps of native life in India; Australian railway pictures; views of Malta and New Zealand; a fountain in Rome; a lucerne field in Australia; a Canadian cattle-ranch; and photos of the British Service Squadron in Sydney.

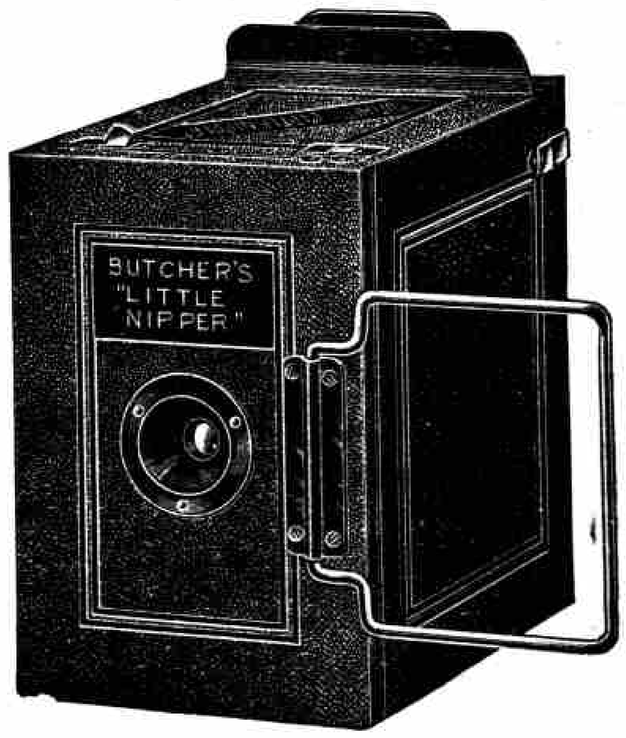
Two prizes were offered, and are awarded to Master Aly Ahmed Shawky, of Cairo, Egypt, the winner of Section A, and to Master F. D. Nrih, of Bombay, India, in Section B. In each case the prizes are Meccano goods to the value of 10/6, and we congratulate these two readers on their well-deserved success.

FROM ITALY



We illustrate above a beautiful dog that belongs to Master R. Bandiera, one of our readers in Italy. The photograph was awarded third prize in one of our recent Overseas Photographic Competitions.

THE
LITTLE NIPPER
PRIZE COMPETITION
For all under 17 years.



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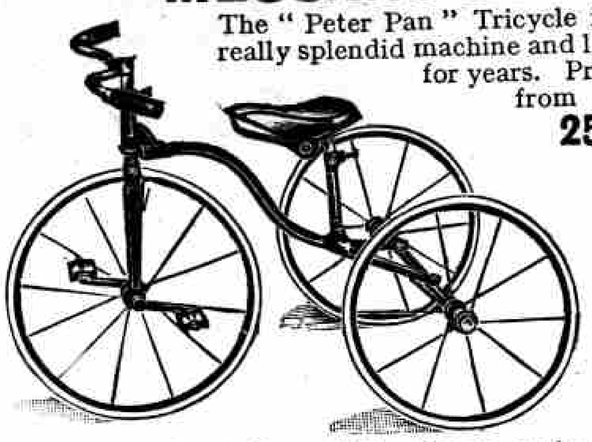

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Variable Gears

by "ROVER"

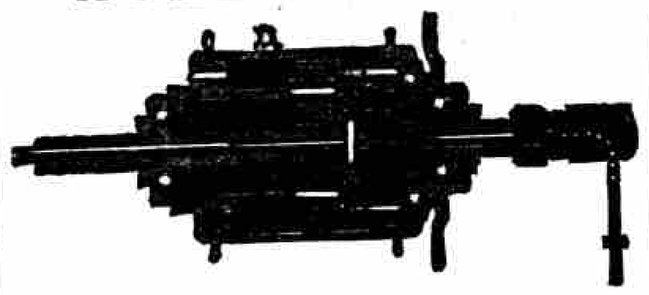
SOME weeks ago a reader very kindly sent me a cutting from a leading cycling journal giving particulars of a five-speed gear that will shortly be available. While this innovation will be watched with considerable interest by every keen follower of cycle design and construction, the great majority of road users probably will remain content with the present two-speed or three-speed gears, which have so firmly established themselves. Every cyclist at some time or other considers the idea of fitting one of these labour-saving devices to his machine, so that a few words on the subject should prove of interest to many readers.

Gears and Levers

Gearing of any sort is primarily a form of leverage, and a variable gear is merely an arrangement by which variations in leverage may be obtained as required. It is impossible to construct a single fixed gear for a cycle that will be equally suitable in all circumstances. A high-geared cycle is fast on the level but is bad for hill-climbing; a low-geared machine is slow on the level but is excellent for hill-climbing. In order to enable the cyclist to travel fast over level roads and still be able to mount hills with the least exertion, combinations of two or three gears have been introduced. These operate either on the bracket or in the hub of the rear wheel.

With the exception of one well-known make, two-speed gears are constructed on the gearing-down principle. By gearing-down is meant that in high gear the drive is direct or straight through, while in the lower gear the drive is through a train of wheels, the effect of which is to reduce the number of wheel revolutions to each revolution of the cranks. By increasing the gear the energy of the rider is used, so to speak, in large amounts, and his speed is consequently increased. Reducing the gear, however, causes the rider's energy to be applied in smaller amounts, with a consequent decrease in speed.

A 3-SPEED GEAR HUB



Courtesy of [*Sturmey-Archer Gears Ltd.*

A sectional view of a Sturmey-Archer Three-Speed Gear Hub, showing the toothed wheels which give the different gears

Novices often wrongly imagine that a low gear enables a rider to climb a hill more quickly than he could do with a high gear, but as a matter of fact the opposite is the case. A longer time is taken to climb the hill but the ascent is accomplished with less effort. The great point to be remembered when changing from normal gear to low gear is to maintain the same rate of pedalling, and not to be tempted into pedalling faster in the endeavour to keep up the same speed.

Two-speed and Three-speed Gears

To the new owner of a bicycle the choice between a two-speed and a three-speed gear is invariably a difficult matter. Unfortunately no fixed rule can be given. The two-speed gear is the cheaper, but the three-speed gear provides a wider range of gears and consequently results in easier riding. Both have their advantages depending upon the work for which they are intended, but whichever is finally chosen, care should be taken that the direct drive is on the gear to be most frequently used. In the case of a two-speed gear it is usually preferable to have the low gear in reserve, and the direct drive should be on the high gear, as in the Eadie variable-hub or other similar make. Some riders prefer to ride mainly through gearing, keeping the direct drive as a reserve gear, but this plan is not to be recommended for general use.

Hub or Bracket Gearing

The three-speed type allows the rider to retain his ordinary gear for normal work, and at the same time gives him a high gear for riding on the level or on down grades and a low one for climbing hills. There are numerous makes of three-speed gears, one of the best known being the Sturmey-Archer. In ordering a variable gear it is advisable to specify a normal drive geared slightly higher than would be the case for a similar single-geared bicycle.

A free-wheel is included in both types of gear, and a back-pedalling brake may be fitted or not, according to the wishes of the purchaser.

Whether the rider adopts hub or bracket gearing also depends on his own choice, as either may be fitted. Many experienced riders maintain that in bracket gearing, that is gearing by the chain-wheel bracket, the extra weight is not so noticeable. They also claim that, as the gear wheels are larger and stronger when the bottom bracket type is used, friction is less likely to be set up. On the other hand a two-speed or three-speed hub is far more simple and equally effective, and may be fitted easily to any make of machine.

The question of the best place for the gear-lever itself is of minor importance. The

(*Continued on page* 270)

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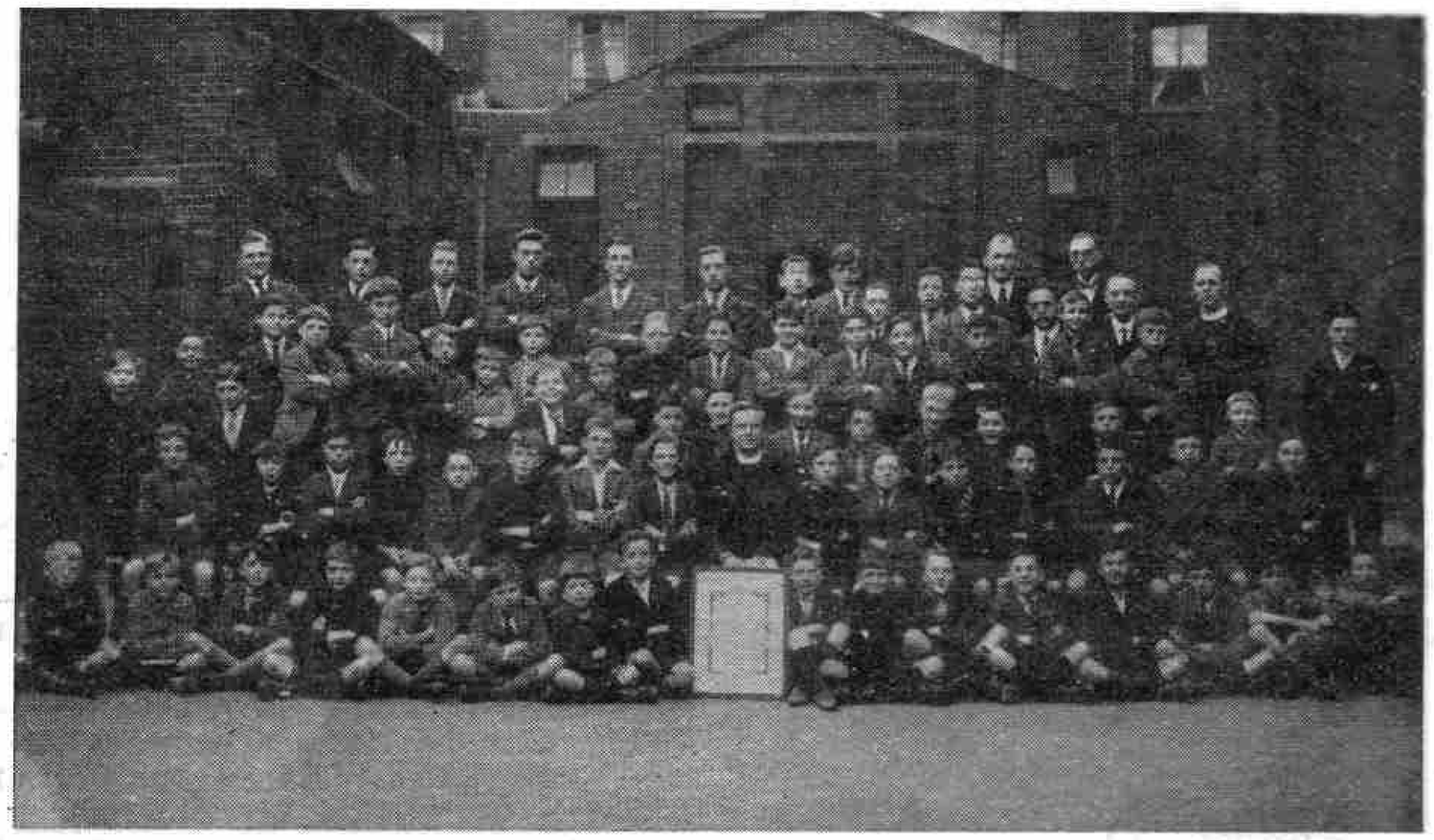
World's Largest Meccano Club

With a club roll of one hundred and three members, the St. Mary's (Newington Butts, London) M.C. now has the distinction of being the largest Meccano Club in the world. The club was founded by the present Leader, Mr. G. Treves, at the beginning of 1921, as the St. Mary-with-St. Gabriel Meccano Club, and its progress has been steadily maintained. The present name of the club was adopted in July 1923, and at the end of that year an Exhibition was held which, in addition to being one of the most successful held by any Meccano Club, resulted in a considerable increase in membership.

To celebrate the premier position attained by the club, a general meeting of all members and old boys was recently called. There were nearly 200 present, and representatives of the local newspapers also attended. The meeting proved very successful and an interesting report was published in the "*St. Mary's Meccano Monthly*," a club magazine edited and printed by the Leader.

Our photograph shows a group of the club members and the Committee, but these represent only about two-thirds of the club's full strength, the other members being unable to attend owing to school duties. The Club President, the Rev. W. J. Margetson, M.A., is in the centre of the group, behind the framed club certificate, and Mr. Treves, the Club Leader, is the last on the right in the back row.

The previous club record was held by the Observatory Meccano Club, of South Africa, with a membership of 80, and as this enthusiastic club is making extensive efforts to regain the title, and has already considerably increased its membership, Guild members no doubt will follow the progress of these two friendly rivals with the greatest interest.



The Secretary's Notes

Very soon club night once more will be the great event of the week, and preparations for the First Winter Session are already well in hand.

The New Session

Club Leaders and Secretaries are busy planning their programmes, arranging lectures and visiting or writing to all past members in preparation for the opening date. Several clubs in fact have already started their First Winter Session, though the majority are waiting until the end of the month before calling their first meeting. I have already received advance copies of a number of club programmes and several of these incorporate new and interesting items for club nights. I hope to be able to pass these on to Club Secretaries in a future issue, and meanwhile shall be interested to receive further copies of any other programmes available.

I should like to draw attention here to the excellent results that may be obtained by the Club Leader visiting the parents of as many of the members as possible before the opening of the session. During such visits the Leader will not only give the parents a better knowledge of the club and its officials, but he will also be able to arouse their interest in the work of the club. At the same time the Leader is very likely to come in contact with gentlemen who are not only qualified, but also willing to give lectures to the club from time to time. Many interesting lectures from engineers, mechanics, sailors and others have been obtained in this manner, while permission to visit various works or factories has often been secured.

For Leaders

As in past years, the summer months have been a strong test of the stability of our new clubs. Unfortunately several of our smaller ones have had to be disbanded, owing to lack of support or for various other reasons, but in every case the club has been of very recent institution with a small membership. Though I greatly regret their failure, it is not to be expected that every club that is started will be a success and become permanently established. With the elimination of the few failures, we are able to commence our new session under the most favourable conditions, confident that every one of the 116 clubs on the records is alive and energetic, and prepared to do its very best for the good of its members.

Live Clubs

The help of every Guild member is needed in the Recruiting Campaign. First of all, see that all your friends are members of the Guild. If you belong to a club, the best way is to take your friend along with you to a club night. Introduce him to the Club Leader and members, and when he sees what a Meccano Club really is he will very soon be asking for an application form. Those who are not near a club should point out the advantages to be gained by being a member of the Guild. The world-wide recognition of the Guild badge, the Correspondence Club—so useful to stamp collectors—the Recruiting Medallions and the competitions in the "*M.M.*" for Guild members only, are all strong arguments which should be used in favour of joining the Guild.

Finally, always remember to have an application form handy—supplies may always be obtained free from Headquarters—so that when you do find a recruit you will be able to make sure of him on the spot! If every member who reads these words will put them into practice a record for 1924 will be assured.

Recruiting Campaign

CLUB NOTES

Davenport M.C.—Members recently spent a week in camp near Middlewich, and some interesting visits were paid to local canals, locks, and salt-works. A visit to the cinema on Wednesday and a cricket match on Friday were thoroughly enjoyed. The campers returned home on Saturday evening after presenting their hostess with a vase in appreciation of her kindness. The Leadership has now been resumed by Mr. Main, who was in charge of the camp, and the Winter Session is being eagerly anticipated. Club roll: 35. *Secretary*: Master A. D. Stoker, 124, Bramhall Lane, Stockport.

Boston Model-Making M.C.—A day's visit to Skegness was the most popular event in the programme of the Summer Session. Splendid weather was experienced, and after tea in the Pavilion, to which members did full justice, the party returned home in the evening. The Cricket Club continues to prove popular, and a full fixture list is evidence of its prowess on the playing field. Several members recently visited the British Empire Exhibition, and the accounts of their experiences were much enjoyed by the club. Club roll: 30. *Secretary*: Master R. Robinson, 30, Woodville Road, Boston.

Redruth M.C.—Owing to its steadily-increasing membership the club has now been divided into two sections, the "Nuts" and the "Bolts," each under a captain. The recently-introduced Ambulance Section is proving very popular and a Second Section will shortly have to be formed. Some weeks ago a visit was paid to the local reservoir, when the surveyor, Mr. King, kindly conducted the party and explained the construction and uses of the reservoir. The Club Magazine is now firmly established, is very well arranged and neatly printed. Club roll: 36. *Secretary*: Master Leonard Trenberth, Tunnel Stores, Redruth.

Barnetby M.C.—Two successful Exhibitions were held during the Summer Session, the proceeds of the second amounting to £3 6s. 11d., which was given to the Church Building Fund. Cricket is a popular evening occupation. A Field Fête was due to be held in the middle of last month, with the object of raising sufficient funds to purchase a billiard-table and football and cricket outfits. Members are keenly interested in wireless, and the club is fortunate in possessing a two-valve set. The membership for the session shows an increase from 20 to 29 and more new members are expected on the opening of the Winter Session. Club roll: 29. *Secretary*: Master R. H. Ward, Laurel Villas, Victoria Road, Barnetby, Lincs.

Australia

Footscray M.C.—This prominent Overseas club continues to make good progress, the programme for the past session including several interesting debates, model-building evenings, wireless and electrical experiments and engineering lectures. The session was concluded with a club banquet and social evening, at which a surprise was sprung on the members by the Club Secretary and an assistant, who built a model stage and cinematograph and gave an excellent entertainment. The club will shortly move into the new Scouts' Hall now being built, when more members can be enrolled. *Secretary*: Mr. H. Roach, 48, Stirling Street, Footscray, Victoria, Australia.

Malta

1st Malta M.C.—Owing to present warm weather, meetings are now being held outdoors as much as possible. A camp at Easter proved quite successful, though it was somewhat marred by bad weather. Outings are being regularly held throughout the present session. Club roll: 26. *Secretary*: Master A. Grech, 173, Prince of Wales Road, Sliema, Malta.

Clubs not yet Affiliated

Windsor M.C.—At present there are 17 members of this club, and a room is now in the course of erection. A Club Leader has not yet been obtained, but it is hoped to secure one very shortly. Intending members should write for full particulars to the *Secretary*: Master K. Greenwood, 83, Victor Road, Windsor.

Richmond M.C.—Already possesses a club-room and adult Leader, and will shortly be eligible for affiliation with the Guild. Meetings are held every Friday at the Duke Street Sunday School-room between 7 and 9. Any Meccano boy interested is cordially invited to attend. *Secretary*: Master E. J. C. Smith, 70, Lower Mortlake Road, Richmond, Surrey.

Linthorpe M.C.—Has been fortunate in securing Mr. Dodd, the chief engineer of Messrs. Dorman, Long & Co.'s (Middlesbrough) Engineering Works as Club Leader. The members were invited to visit the Works, and a very enjoyable and interesting time was spent. A local Exhibition of models has been temporarily postponed, but several outings for the summer months are being discussed. Affiliation will be applied for as soon as a club-room is obtained. *Secretary*: Master G. Pringle, 20, Poplars Road, Linthorpe, Middlesbrough, Yorks.

Peebles M.C.—The enthusiastic Club Secretary has now been successful in obtaining the Secretary of the local Y.M.C.A. to act as Club Leader, and as a club-room has already been secured, affiliation will shortly be granted. The Suspension Bridge across the Tweed near Peebles makes a splendid subject for a Meccano model, and the members are taking full advantage of the fact. *Secretary*: Master De Lancey Samwell, St. Peter's Rectory, Peebles.

Penarth M.C.—Several interesting lectures on Cranes, Bridges and other Engineering subjects have been given by members. A paper-chase held early in the season was greatly enjoyed and a variety concert given by the club proved equally successful. An adult Club Leader has not yet been found, but it is hoped to persuade some local gentleman to take up this office in the near future. *Secretary*: Master M. Hallett, 64, Westbourne Road, Penarth, Glam.

Meccano Club's Exhibition

A Sixth Annual Exhibition is being arranged by the Holy Trinity Meccano Club on the 17th and 18th October. Working models will be on view, and also a miniature railway system. Guild members and their friends in or near London are cordially invited to visit the Exhibition, and a further announcement, together with particulars of how to reach the **Hall**, will be given next month.

How to Run a Meccano Club

by the

Guild Secretary

LAST month I drew attention to the desirability of encouraging club members to prepare and read short lectures or papers on some subject in which they are specially interested. In the ordinary way it is unusual for a boy to stand up before his friends to read a paper of his own composition, but from every point of view it is excellent for him to accustom himself to do this. The research necessary in preparing a paper, and the orderly thinking needed to write it are splendid practice for any boy, and the actual reading of the paper develops a confidence that will be of the utmost value to him in later years.

Preparing the Papers

At the same time it is only in exceptional cases that a boy is able to attempt this work entirely unaided. The Club Leader can help very considerably in giving advice in regard to the best books to read and the most likely places in which to search for the information required. The Leader may also assist in the preparation of the paper and in giving a few hints as to correct and confident delivery. There are always large-hearted people around who are ready to help, and no doubt the young lecturer will be able to obtain considerable assistance from parents, employers, teachers and older friends.

The reading of the papers should not occupy more than about a quarter of an hour, and each one may be followed by a few appropriate comments from the Club Leader, who should encourage the members of the club to ask questions and join in a general discussion of the paper. In such discussion it often happens that some members are able to add interesting additional facts to those put forward by the lecturer. Illustrations by working models will also prove very helpful, but care must be taken that this is not overdone, because then it becomes tedious and spoils the whole effect. Principles should be dealt with in a few clear sentences, and all involved technical terms should be avoided, as the younger members will not understand them, and will not be impressed by them no matter how clever they may sound.

Special Medallions

The subjects to choose from for preparing such lectures are innumerable, and in a later issue we shall give a list of suggested titles, each one of which will provide enough material for half-a-dozen lectures, so that there should be no repetition of topics in any club for a very considerable period.

In order to encourage this feature of papers by members the Guild allots each session a Special Merit Medallion to each club, to be given to the member who delivers the best paper. After the papers have been read at the club meetings, the one that is considered to be the best, either as the result of a vote of the whole club or as the decision of the Leader, must be sent to me at the end of each session with any comments by the Leader.

This Special Merit Medallion, which is illustrated on this page, is very beautiful both in design and finish, and on each one will be engraved the name of the recipient, which will also appear in the "*M.M.*"

Inventing with Meccano

One of the best features of Meccano is that it encourages boys to invent, and in the work of invention the best qualities of an individual—initiative, keen thought, patience and perseverance—are brought into play. This opportunity for invention, therefore, should be given the greatest possible encouragement by Club Leaders and Secretaries. It may be fostered by means of competitions among members, and often patrons of the club will be willing to offer prizes to those who excel, particularly if a model happens to show some mechanism in which they are commercially interested. The results may be inserted in the local paper, and if a local dealer is approached no doubt he will be pleased to exhibit the winning models in his shop windows, with a neat card announcing the results.

(To be continued)

Special Merit Medallion
(About half actual size)

Meccano Club Leaders

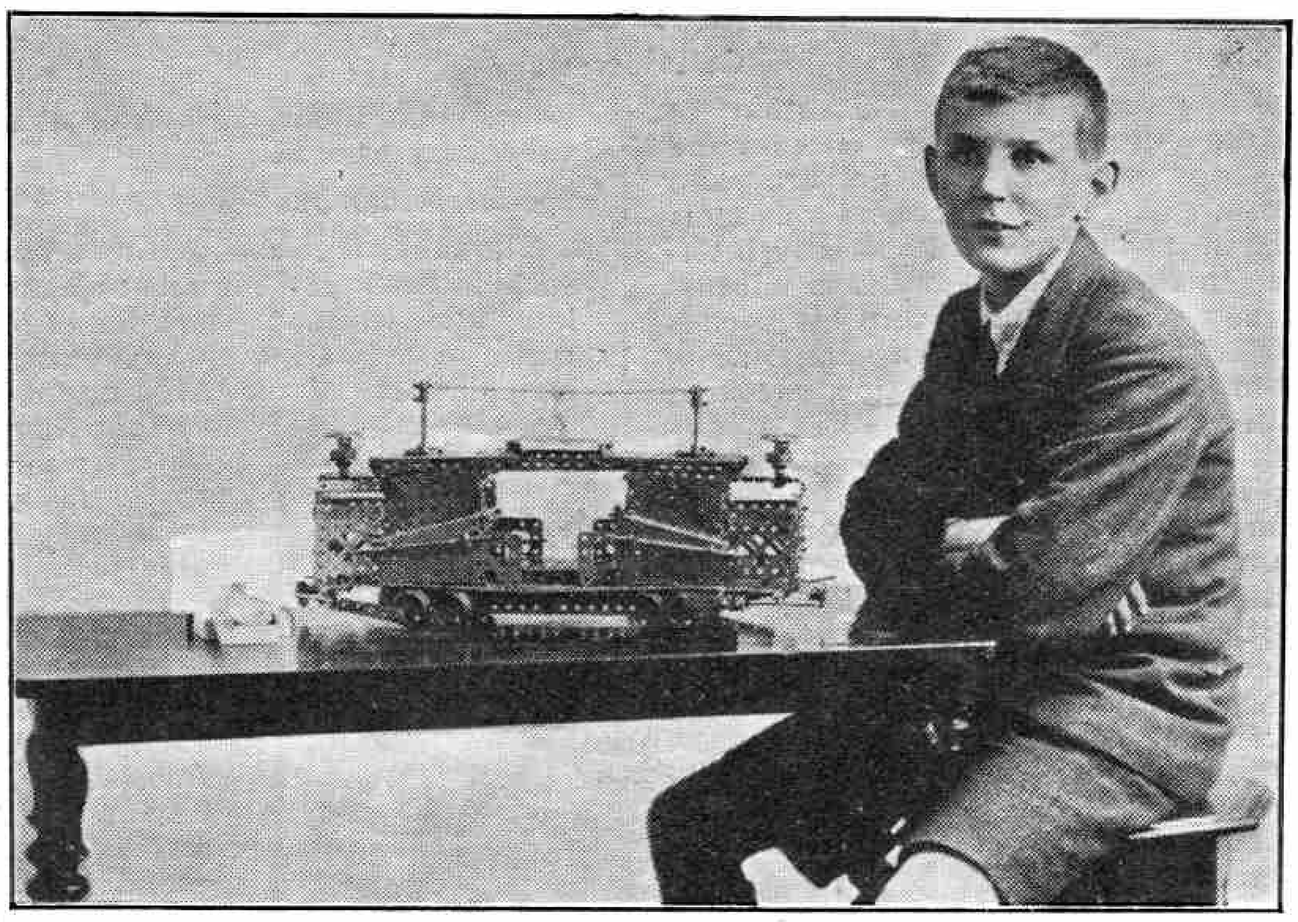
No. 15. Mr. LIONEL C. HOBBS

The Leader of the "Glevum" Meccano Club, Mr. Lionel C. Hobbs, was the first Scoutmaster to form a Meccano Club in conjunction with his Scout Troop. The innovation proved exceedingly popular, and many Scout and Cubmasters have since followed suit with equal success.

Founded in March 1920, the "Glevum" M.C. was affiliated with the Guild in June of that year. The Club is attached to the 1st Gloucester British Boy Scouts, a troop formed in June 1909. Cricket and swimming are popular summer activities, and a week's camp is arranged by the Leader every year. At a recent big concert, organised by this Scout Club, the sum of £20 was raised towards the expenses of a visit by the Scouts to the British Empire Exhibition at Wembley.

Members of the "Glevum" M.C. are to be heartily congratulated on their good fortune in securing such an enthusiastic and capable Leader and Scoutmaster.

Staffordshire Reader's Success



Our illustration shows Master John W. Bagnall, of Stafford, who recently won the First Prize in a model-building competition organised by Messrs. W. H. Smith & Son. John is eleven years old and is keenly interested in engineering, which is scarcely surprising, as his father is an engineer. His greatest interest, however is in railways, and he has a thorough knowledge of the many different types of locomotives all over the world. His prize-winning model is of a Mexican Railway Loco shown in the accompanying photograph.

Electricity—(*cont. from page* 239)

domestic purposes. In a large town the current from the power station is led along underground cables to sub-stations distributed at various points, and generally underground. From the various sub-stations the current is distributed as required by a network of underground cables. At each sub-station the current passes through a step-down transformer so that its voltage is lowered to the required point. The current is then ready for use, but of course it is still alternating current, and if it is desired for certain purposes to have a continuous current supply, the alternating current must be converted. This may be done by means of an electric motor and a dynamo coupled together. The motor is constructed to run on the alternating current from the transformer and it drives a dynamo that generates continuous current. There is also a machine called a "rotary converter" which is largely used and which does the work of both motor and dynamo.

In this article we have dealt with power stations in which the source of power is steam. Another source of power is that of water. Water power is only used to a very small extent in this country, but in many parts of the world, particularly in America, enormous hydro-electric power stations have been constructed. Next month we shall describe some of these hydro-electric schemes, and especially those in which the immense volume of water passing over the Falls of Niagara is harnessed and made to produce current supplying light and power for huge areas.

NEXT MONTH :—

Harnessing Niagara :
Hydro-Electric Power Stations

Stamps for Sale

(*See also page* 262)

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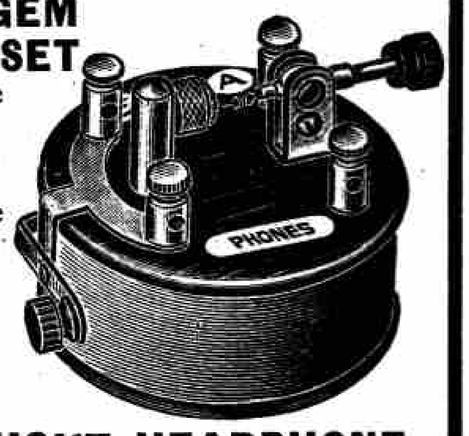

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Variable Gears—(*cont. from page* 267)

top tube or the handlebars are the usual alternatives, and though the former position is becoming increasingly popular, the gear-lever situated on the handlebars avoids the necessity of taking one hand away from the task of steering in order to change gear.

NEXT MONTH :—

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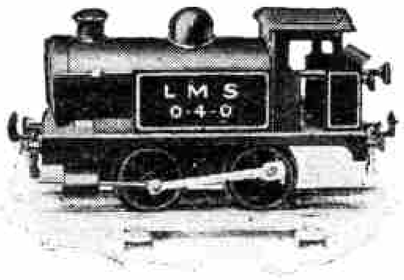

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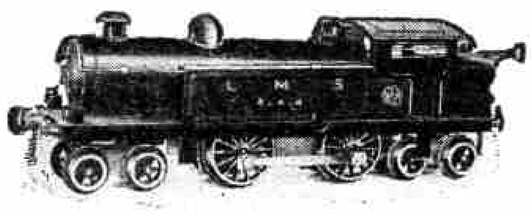

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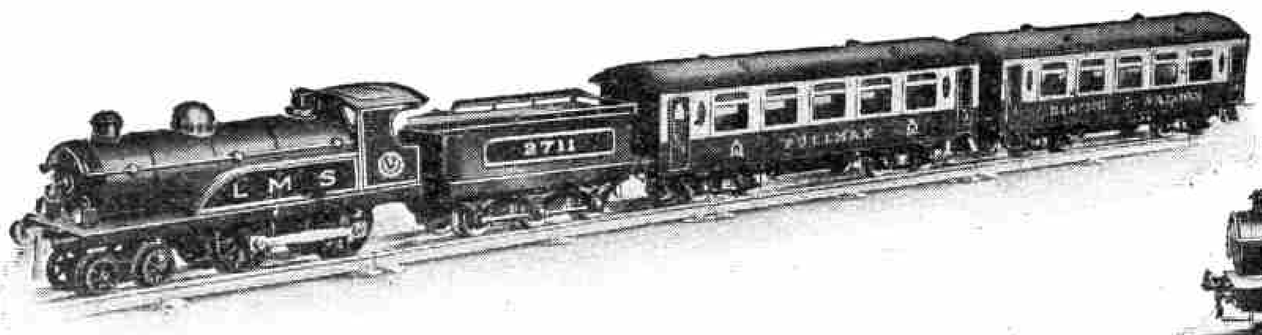

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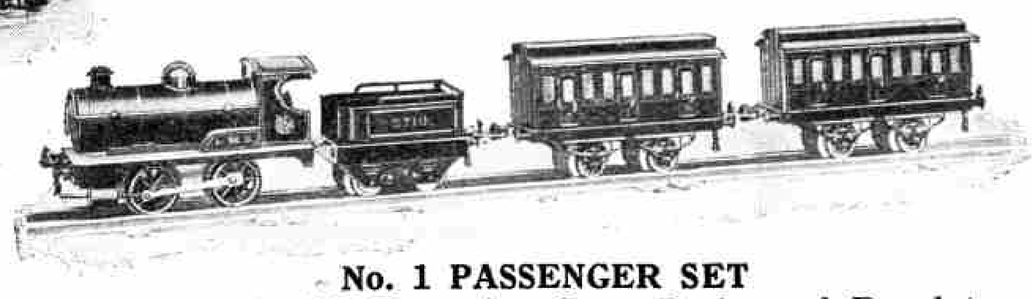

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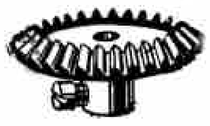

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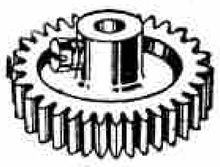

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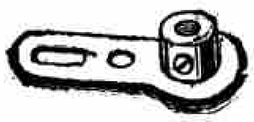
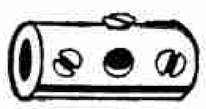
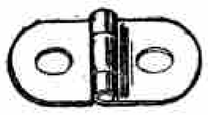
Set-screws
2d. each



No. 62
Cranks
3d. each



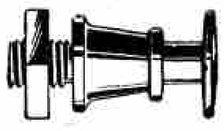
No. 63
Couplings
6d. each



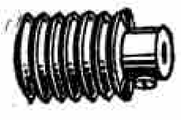
No. 114
Hinges
Per pair **4**d.

No. 115
Threaded Pins
2d. each

No. 136
Handrail
Supports
3d. each



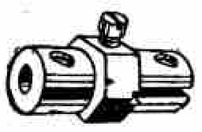
No. 120
Buffers
2d. each



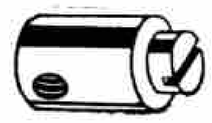
No. 32
Worm Wheels
6d. each

No. 123
Cone Pulleys
1/3 each

No. 116
Fork Pieces
3d. each

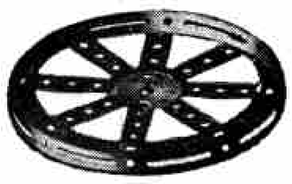


No. 63b
Strip Couplings
8d. each

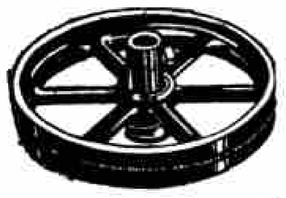


No. 64
Threaded Bosses
2d. each

No. 2 MECCANO OUTFIT



No. 118
Hub Discs
5½" diam.
1/3 each



No. 132
Flywheels
2¾" diam.
2/3 each

PRICES OF MECCANO OUTFITS

No.00 Outfit	...	**3/6**	Postage **6**d.		No. 5 Outfit	Carton ...	**55**/–	(Carriage forward)
„ 0 „	...	**5**/–	„ **6**d.		„ 5 „	Oak Cabinet	**85**/–	„
„ 1 „	...	**8/6**	„ **6**d.		„ 6 „	Carton	**105**/–	„
„ 2 „	...	**15**/–	„ **9**d.		„ 6 „	Oak Cabinet	**140**/–	„
„ 3 „	...	**22/6**	„ **9**d.					
„ 4 „	...	**40**/–	„ **1/-**		„ 7 „	„	**370**/–	„

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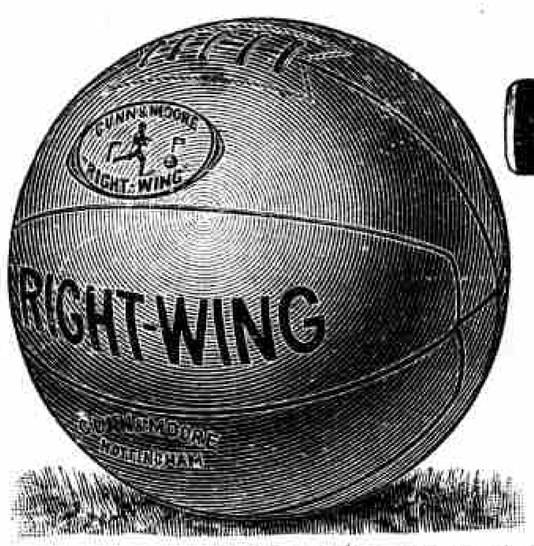
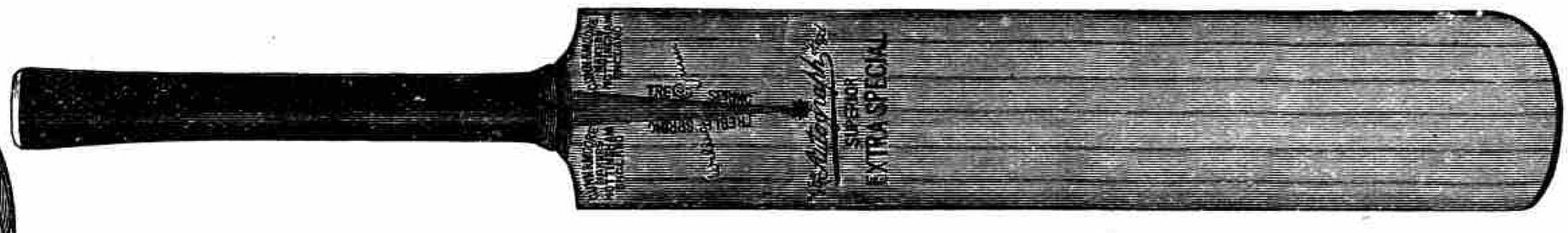
GUNN & MOORE LTD.

Sole Manufacturers of the World-Famed

WILLIAM GUNN "AUTOGRAPH" (Regd.) and "CANNON" CRICKET BATS.

Also Other Grades in Men's and Boys' Sizes.





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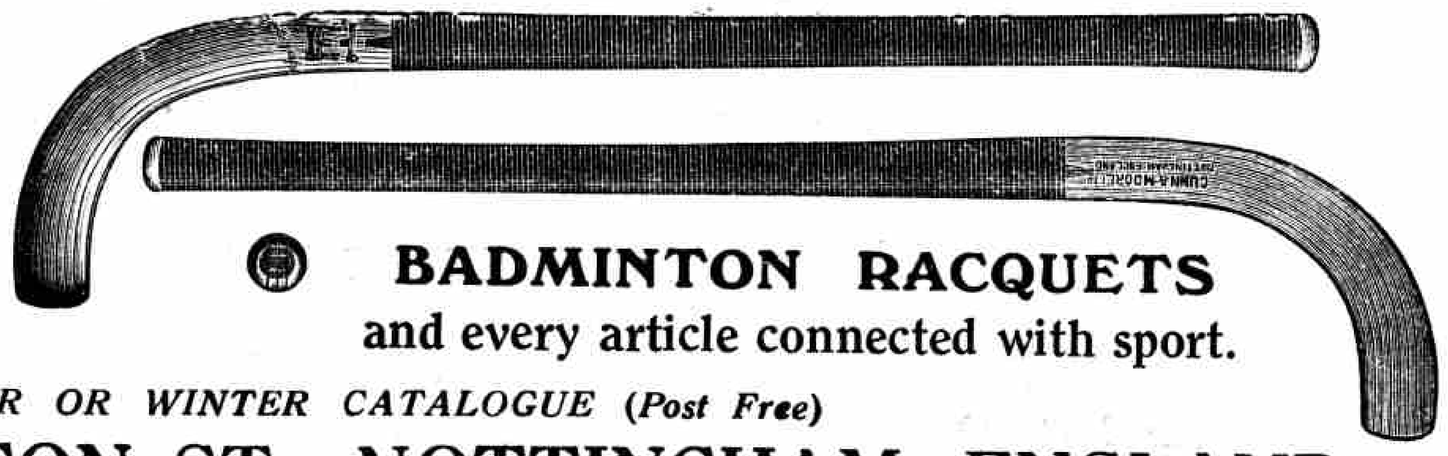
In Various Qualities.

HOCKEY STICKS A SPECIALITY.



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BADMINTON RACQUETS

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Box A. Complete with Plans, Bricks, Roof, Fences and Trees. ... 5/-

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„ 3. 49 Designs as in Model Village. 17/6

„ 6. Plans, Bricks, Roofs and 71 Designs. ... 35/-

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Containing Trees, Fences, Roofs, Shells, Shrubs, etc.

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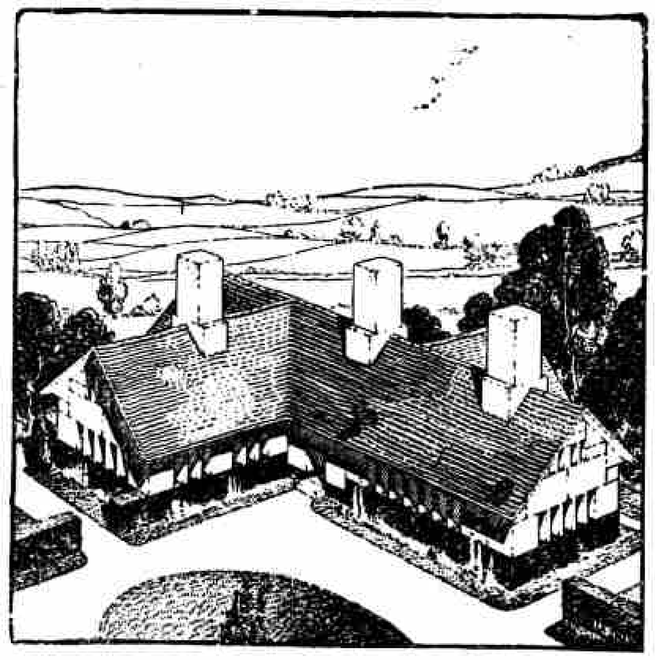

A COUNTRY HOUSE, ONE OF 49 MODELS CONTAINED IN BOX 3, SERIES "B."

TUDOR BLOCKS OF HALF-TIMBERED DESIGN.

Box 1. 6 Complete Model Buildings. 3/6

Box 2. 12 Complete Model Buildings. 7/6

„ 3. Beautifully packed in Wooden Box, with Tray containing Trees, Fences, and many original Designs. 17/6

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Littlehampton	Townsend & Co.
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Brighton	J. Beal & Son.
Worthing	J. H. Ray.
Broadstairs	Parson's Library.
Chichester	Willis & Co.
Hove	M. & E. Dench.
Margate	W. C. Redman.
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24″	26″	28″	30″ Chest
7/6	8/3	9/-	9/9

Navy/Saxe
Light Fawn/Brown
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SECCOTINE
FOR MEN

MEN use Seccotine for numberless things. A yacht mast has been mended with it. Carpenters—amateur or professional—find in it the best and strongest glue, requiring no heating. The repairs to musical instruments, billiard cues, golf clubs, house furniture, are made with Seccotine; rubber tyres are affixed to rims of racing cycles. Uses are innumerable.

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FOR WOMEN

WOMEN use Seccotine to save sewing in making all kinds of fancy articles, in patching clothes, mounting photographs, trimming hats, repairing brushes, and all kinds of house articles. Laces and all light garments of silk or muslin are stiffened by it.

SECCOTINE
FOR BOYS & GIRLS

CHILDREN mend their toys or make new ones. There is a Seccotine box (1/6) which contains models of church, school, and houses, of varying size. By use of these hand and eye are trained to work together.

FIRMAS (Heat Seccotine) should be used if the repaired articles are required to hold liquids, hot or cold.

Tubes 4½d. 6d., 9d. everywhere. Booklet of interesting information free on application to

M'CAW, STEVENSON & ORR, LIMITED, THE LINENHALL WORKS, BELFAST

Small Advertisements

(*See also page* 276

HOW TO BE TALLER

TALL, GRACEFUL. She or he gets attention, respect, and admiration. You can be 2, 3, or more inches taller. Surprise your friends. Send only 1½d. stamp. **M. M. Edison, 51, Church Street, South Shore, Blackpool.**

CONJURERS

and all interested in magic, must write for our catalogue of **REAL TRICKS.** Stamp for List.

MAGICAL MART,
17, Alston Buildings, Spiceal St., Birmingham.

FREE IN 7 DAYS OF

BLUSHING

You can be a Success in Business and Social Life.

You must have Self-Confidence, Nerve "Control," and never be at a loss for words; never "tongue-tied" or embarrassed. **The Healthy-Nerve Strong** are the Winners in the Battle of Life. **Nerve Weakness, Blushing, Self-Consciousness, Fear, Shyness** have kept many a good man and woman **"down and out."** If you are a victim of any form of **nerve or heart trouble, YOUR DAY** has arrived to **get FREE** of your handicap. **You** can be **cured permanently** in **7 days** without harmful drugs or auto-suggestion drill. No nonsense. Immediate permanent benefit. **Gain Nerve Power, Self-Confidence** and **Personality** that will make others **admire and respect** you. **Write at once** for free particulars. **Will be sent free** privately, if you mention "Meccano Mag."—Address: **Mr. O. E. DEAN, 12, All Saints' Road, St. Annes-on-Sea.**

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Loads 15 shots, repeating action, nicely finished, each in box with instructions and supply of ammunition.

No.		post free.
1	Black model with nickelled trigger ...	1/3
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3	25-shot heavy black model	2/6

Foreign and Colonial postage 9d. extra.
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Boys Love Conjuring

Card Tricks, 6d. each, six for 2/9, twelve 5/–, all different; Chinese Linking Rings, 1/6; Magic Ball Box, 1/–, 2/– and 2/6; Fortune Telling Cards, 1/2; Box of Coin Tricks, 5/–; Magnetized Penny, 8d.; Wonderful Wizards Pack, 3/–; Cigarette Vanishers, 1/3; Book "Second Sight," 7d. Full instructions with all tricks. Catalogues 2d.—**Midland Magic Co., 43, Stanley Road, Earlsdon, Coventry.**

CYCLE DYNAMOS

Make the "Dixie" Cycle Lighting Dynamo from our full set of armature windings, plans and instructions, 2/6 post free. You need no lathe or castings to make this wonderful dynamo, and the results are guaranteed. Debco, Engineers, 6, Loampit Vale, Lewisham, S.E.

I CURED MYSELF AFTER 20 YEARS.

STAMMERING

After Stammering terribly for **20 years** and **trying 'teachers,' schools,** and advertised methods **without relief,** I at last **discovered the real cure** for Stuttering and Stammering (which is **very simple**), and **cured myself.** Now **no stranger could tell** that I had ever been a stammerer. **YOU** (or your child) **can be quickly cured** in the same way. Thorough and permanent cure **Guaranteed** or no charge. Full particulars will be sent **free** privately if you mention "Meccano Magazine." —**Mr. FRANK A. HUGHES, 7, Southampton Row, London, W.C.1.**

MAKE GRAMOS.
Our 32 page Catalogue tells you for **2d. how to do it** and what accessories to choose. **Motors** in 25 sizes, from **10/–**. Tone-arms, **4/6**; Speakers, **2/6**; Headphones, **10/6** pair; Cabinets from **9/–**. Gramophones from **30/–**. Carr. paid. **The Regent Fittings Co., D.78 120, Old St., London, E.C.1.**
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The long evenings will soon be here again and you will want to do more experiments with Wireless.

If you want good results buy all your parts from

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Money refunded on any article if unsatisfactory

Use a SERVICE Detector

and get the maximum amount of satisfaction.

Crystal replaced in a few seconds, NO SOLDER BEING REQUIRED.
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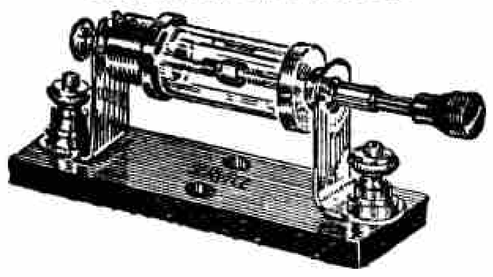

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Glass enclosed and dustproof. Spring for holding crystal in place. Highly polished nickel-plated or gold lacquered finish. Undoubtedly finest value obtainable.

Obtainable at all Wireless Stores.

Price **2/6.** *For Panel Mounting* **2/-.**

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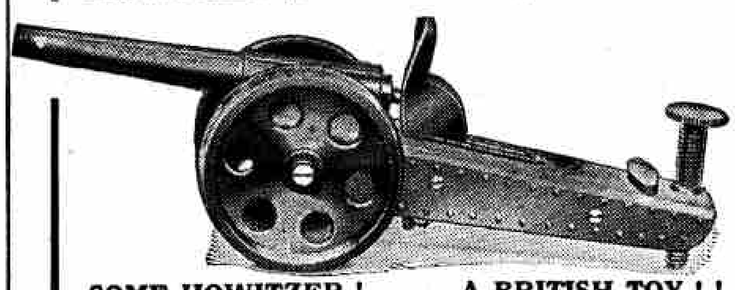
It Bangs! Flashes! and Shoots!

No Caps, Powder, or Special Ammunition

Practise and Beat Father with this beautifully finished Cannon, built with Bronze, Steel and Brass



SOME HOWITZER! A BRITISH TOY!!

4/9 post free.

Money returned if you do not approve.

HANWELL'S TOYS,
38, Alexandra Road,
NORTHAMPTON.

How Wireless Valves are Made—(*Cont. from page* 257)

It is very necessary that a perfectly air-tight joint should be made, and the greatest care must also be taken to ensure that no stress is set up in the glass during the operation. So beautifully does the machine do its work, however, that notwithstanding these severe calls upon it, there are very few faulty stems to be rejected at the final inspection.

(*To be continued*)

Control Numbers—(*cont. from page* 263)

the year of issue. Thus, instead of having the control letter "C" (which was the one then in use), the figure "4" was added to indicate the year 1904, and the control thus became "C4." This was followed by "D4," "D5," and so on, the letter continuing to indicate the batch or order letter. Two controls with the same letter (as "D4" and "D5") mean that the "D" order was not completed in 1904 and that the remainder was printed in 1905, and so on.

Details of Controls

The numbering was re-commenced at "A" when the new printers took over in 1911, and again in the same year when the first Georgian stamps appeared. At the same time the system of control numbers was extended to all values up to one shilling, instead of being confined to the ½d. and 1d. values as previously.

During the present reign the stamp printing has been shared by the Board of Inland Revenue at Somerset House and by two firms, Messrs. Harrison & Sons and Messrs. Waterlow & Sons. The stamps printed at Somerset House have control numbers in thin type and have a full-stop between the letter and number (Fig. 1). The Harrison stamps have thick letters and figures 5 mm. high (Fig. 2), while the Waterlow stamps have letters and figures 3 mm. high (Fig. 3).

Fig. 3

Advanced collectors include all these controls in their collections, often with three stamps attached to each control (as in Fig. 2). The stamp above the control itself is the essential stamp, of course, that on the left serving to show the position of the control on the bottom row, since it allows the corner margin to be retained. The stamp on the right is retained in order to make the whole more evenly balanced. This is the most expensive way of collecting controls—for it means that three stamps have to be paid for every time a new control is issued, which is about once a fortnight.

Some collectors collect controls without the stamp on the right, and some with only the one stamp above the control itself. Although this saves initial outlay the collection is by no means so valuable.

A Meccano Boy at Wembley—

(*Continued from page* 253)

get cool, for after standing near the bread and biscuit-making exhibits for so long I felt very hot. Then I passed on to where beautiful fabrics were shown in all manner of delicate shades. Here I thought how my mother and sister would revel in this part of the Exhibition, but I have no use for these things! So I passed on to the British Dye section, with dozens of delicately-tinted materials, all dyed with British dyes. Glass cases and bottles displayed hundreds of beautiful shades of dyes, and I could not help wondering why people imagine they must send abroad for really satisfactory dyes.

(*To be continued*)

Readers' Sales and Wants

If you have anything to sell or wish to buy anything, take advantage of the service offered by a small advertisement in these columns. (Advertisements of Meccano goods cannot be inserted).

The rates are one penny per word, with a minimum of 1/– (cash with order).

Your advertisement must be received before the 10th of the month for insertion in the following month's issue.

Two-valve Wireless Set, 50/–. Marconi royalty extra, range 400 miles.—Phillips, 64, Ewart Street, Brighton.

N.D.C. Breech-loading Gun, elevating crank and side screw wheel. Realistic shells. Price 5/–, post paid. —Hall, Inverlune, Lancaster.

Thornton Pickard ½-Plate Folding Camera, variable shutter, slide, dark room lamp, 30/–.—Elliott, 69, Station Street, Mansfield Woodhouse, Notts.

One Fairy Cycle for Sale. Almost new. £2 10s.—Thomas, Cedars, Dawlish, Devon.

Wanted to get in touch with people interested in the import of Maltese Lace and Cloth.—Box No. 101, *Meccano Magazine*, Liverpool.

For Sale. 85 "Model Engineers," 1920 to 1922.—16, Llanarth Square, Pontymisterer, Mon.

Little Nipper Camera. New, five plates, three plate-holders, 5/–.—Box 98, *Meccano Magazine.*

Fretwork Designs (Hobbies) for sale, 3d. each. State wants.—Boney, Boscastle, Cornwall.

Youth's New De-Luxe B.S.A. 3-speed Cycle. Purchased July, ridden once, £5/10/–, cost 10 guineas. Dr. James, 74a, Lansdowne Road, Holland Park, London, W.11.

Model Railway, 25/– or offers. Cost 60/–.—Box 103, *Meccano Magazine.*

No. 2 Brownie Film Developing Tank and instructions, nearly new, 12/6 or nearest.—Stevens, High Street, Oakham, Rutland.

Two L.N.W.R. brake third class, One L.N.W.R. first class corridor coaches (Bassett-Lowke), 1¼" gauge, 13" long, new condition, 29/– the three. Cost 45/–.—Tuller, Wandsworth Road Station Cottage, London.

Small Advertisements

(*See also page* 275)

CATAPULTS.—Powerful, accurate, and reliable weapon, complete with 50 rounds ammunition, 1s. 9d., posted; silent Walking Stick Catapults, Air Guns, elastic, etc.—Young's, M., Net Makers, Misterton, Som.

WIRELESS.—Send P.C. ask our price for any article in wireless.—Heron Bros., 6, Muirpark Street, Partick, Glasgow.

ADVICE, HANDBOOK & CONSULTATION FREE. King, Registered Patent Agent, 146a, Queen Victoria Street, London, E.C.4. 37 years' references.

CINEMA FILMS.

SALE—HIRE—EXCHANGE, also Machines, Re-winders and Accessories. Good Sample Film, **1/-** Post Paid.

LISTS FREE.

Filmeries, 57, Lancaster Rd., Leytonstone, LONDON, E.11

FILMS CHEAP. Cinemas from 6/–. Free List.—Pictureland, (M) 208a, Abbey House, Victoria Street, London.

CINEMA FILMS—100 ft., 1/–; 1000 ft., 6/– delivered. Pictures for Slides—200, 9d.; 400, 1/–. Wireless Sets, all types, cheap. Repairs. Advice for stamp. —Phillips, 64, Ewart Street, Brighton.

OLD ENGLISH AND ROMAN COINS, Silver and Bronze; English Copper Tokens; S. African Medals cheap lists.—Appleton, 53, Albany Road, Coventry.

ANYTHING TO SELL?

This Space is set to ½ inch s.c. and costs 5/– per month. This sum is the 64th of £16, the price of a whole page advertisement. 55,000 copies of the Dec. number were issued and distributed all over the world. You therefore reach this exclusive public at the rate of one penny a thousand.

CUT THIS OUT.

"Meccano" Pen Coupon. Value 3d.

Send 5 of these coupons with only 2/9 direct to the **Fleet Pen Co., Fleet Street, E.C.4.**

You will receive by return a splendid British 14-ct. Gold Nibbed Fleet Fountain Pen value 10/6 (Fine, Medium, or Broad Nib). If only 1 coupon is sent the price is 3/9. 3d. less for each extra coupon up to 4 (Pocket Clip 4d.). Satisfaction guaranteed. Your own name gilt letters, either pen 1/– extra.

Lever Self-Filling Model with Safety Cap, 2/– extra.

23 PRIZES!

for a few words on a postcard. Every boy or girl has an equal chance. A few minutes' thought, or a report on something that has come under your personal observation, and you may win the first prize. We want you to tell us of:

A new use for Plasticine

or

How Plasticine helped me out of a difficulty

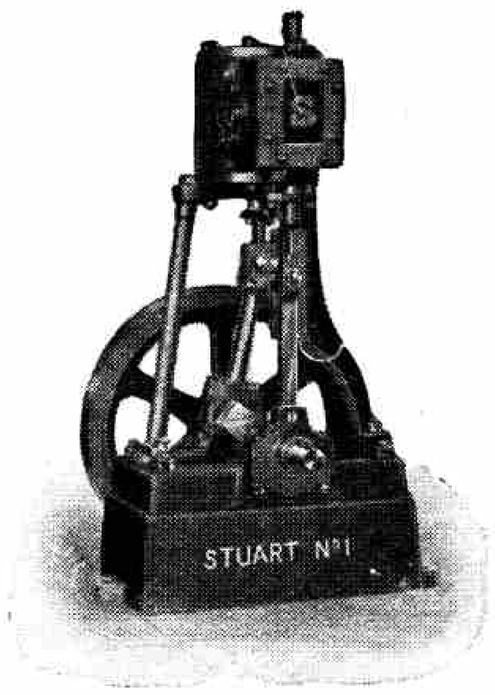
or

When I found Plasticine most useful

Confine your answer to about 50 words on a postcard. One use or idea only on each card. You may send as many as you like. First prize **10**/–, two of **5**/– each, and 20 of **2/6** each.

Get a packet of Plasticine right away and just think things out. We know of hundreds of uses for Plasticine, and there must be as many more that *you* know of but *we* don't. But we *want* to know and offer you cash for them. If you cannot get Plasticine from any shop in your town send for one of our Rainbow Boxes of 6 colours, post free **1**/–, and get busy. Closing date 30th September.

HARBUTT'S PLASTICINE LTD.
99, Bathampton, BATH



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that you can build yourself. From 5/– upwards.

At WEMBLEY, Palace of Engineering, Ave. 1. Bay 26.

If you cannot possibly come, send a stamp for our List No. 12M.

Stuart Turner Ltd.

HENLEY-ON-THAMES

STAMMERING

Genuine Thorough Cure in 40 Days.
Guaranteed. Write for full particulars FREE.
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MAKE YOUR OWN METAL TOYS

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Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 2d. per copy. It will be mailed direct from this office, 1/6 for six issues and 3/– for twelve issues (post free).

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Small Advertisements. 1/– per line (average seven words to the line), or 10/– per inch (average 12 lines to the inch). Cash with order.

Display. Quotations for space bookings, and latest circulation figures, will be sent on request.

Press Day, etc. Copy must be received not later than 10th of each month for publication in following issue. Half-tone blocks up to 100 screen.

Remittances. Postal Orders and Cheques must be made payable to Meccano Ltd.

Obtaining the "*M.M.*" Overseas

Readers Overseas and in foreign countries may order the *Meccano Magazine* from regular Meccano dealers, or direct from this office. The "*M.M.*" is sold Overseas at 2d. per copy, or mailed (post free) direct from Liverpool, 1/6 for six issues, or 3/– for twelve issues.

IMPORTANT.

Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the home market. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms concerned.

CANADA: Meccano Ltd., 45, Colborne Street, Toronto.

AUSTRALIA: Messrs. E. G. Page & Co., 379, Kent Street, Sydney.

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SOUTH AFRICA: Mr. A. E. Harris, P.O. Box 1199, Johannesburg.

STEEL SCREWS

FOR MODEL MAKING.

Perfectly Accurate-fitting Threads.

NUTS and HEXAGON-HEAD BOLTS of Correct Model Engineer Standard:

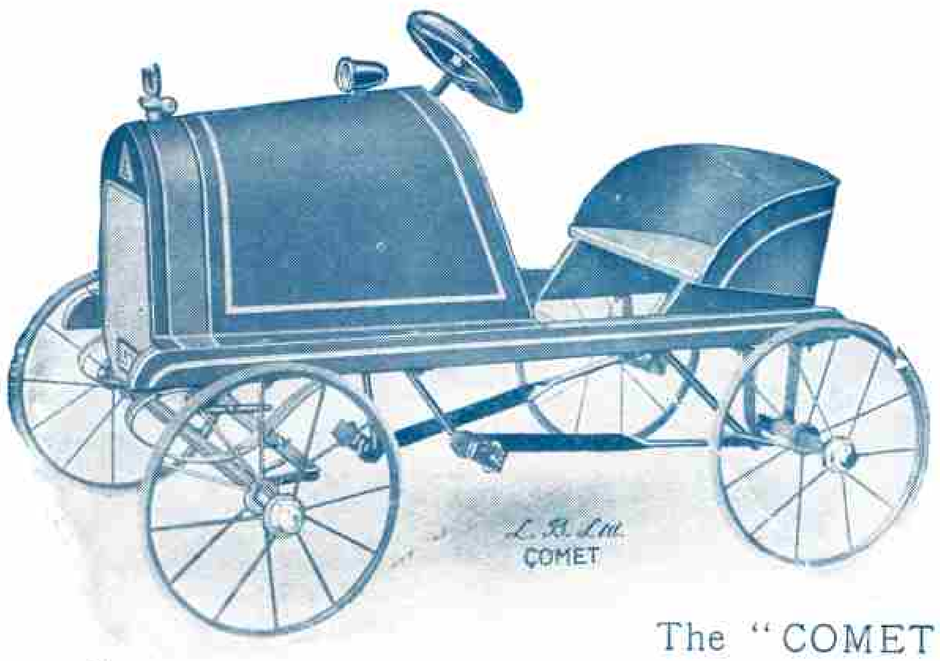
	Per Doz.						
	1/16"	3/32"	⅛"	5/32"	3/16"	7/32"	¼"
Cheesehead Screws × ⅜" long	3d.	4d.	5d.	...	...	...	...
× ½" long	4d.	5d.	6d.	7d.	7d.	8d.	...
× 1" long	...	...	...	...	...	...	10d.
Countersunk Head × ¼" long	4d.	5d.	...	7d.	7d.	8d.	...
× 1" long	...	...	...	...	...	...	10d.
Hexagon Head × ¾" long	5d.	7d.	9d.	1/–	1/2	1/4	1/4
× 1" long	...	...	...	...	...	...	...
Nuts, Hexagon	4d.	5d.	6d.	6d.	9d.	11d.	1/–

Send 4d. for a Sample Screw and BOND'S ALL MODEL PRICE LIST.

Bond's o' Euston Road, Ltd., 25c, Euston Rd., N.W.1

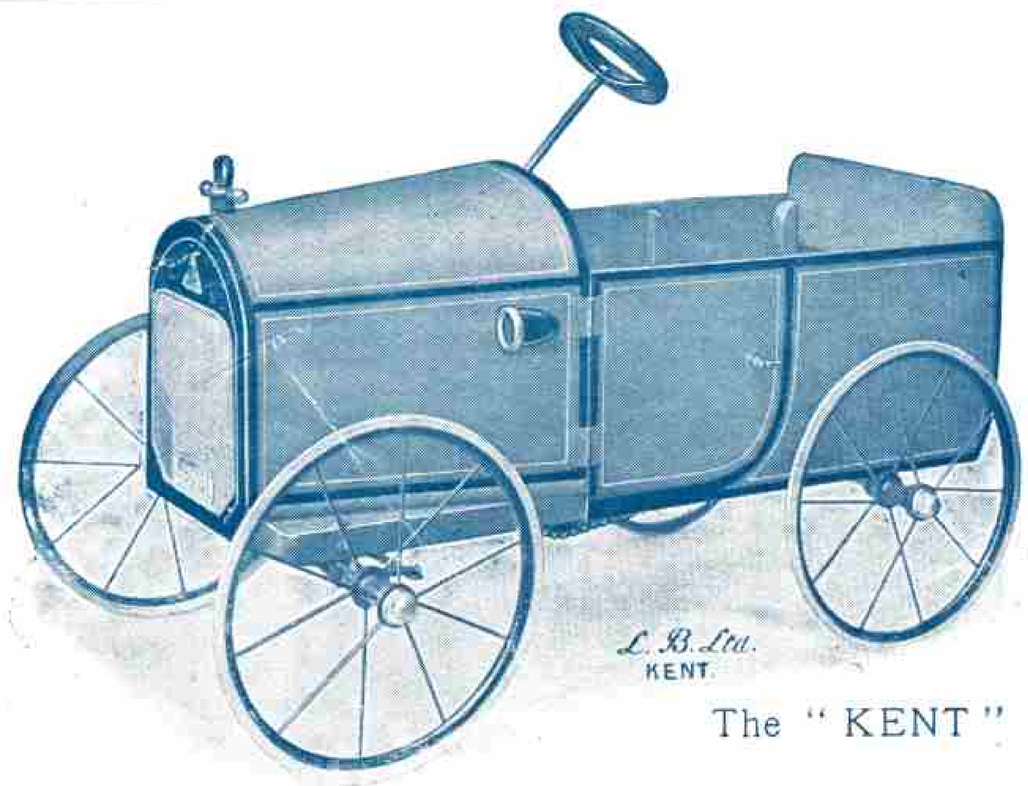
RECORD BREAKING!

Photographs of some of our Record-breaking Low Price Models at the British Empire Exhibition



The "COMET"

A very natty Auto for the speed merchant. It has a double crank movement, 10" wired-on tyred wheels, lamp, etc. For ages 2–7 years. **27/-**

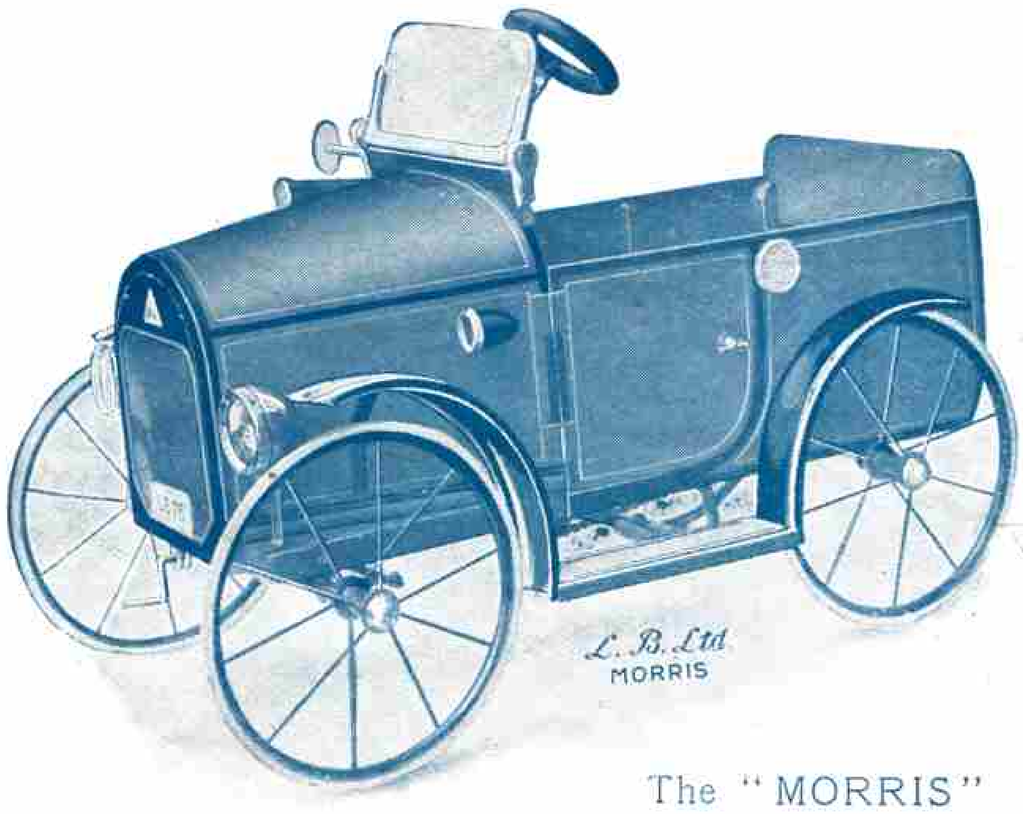


The "KENT"

This smart little Runabout is fitted with a door, 2 side lamps, 12" wired-on tyred wheels. **49/6**

ASK DADDY TO LET YOU HAVE A CAR OF YOUR OWN

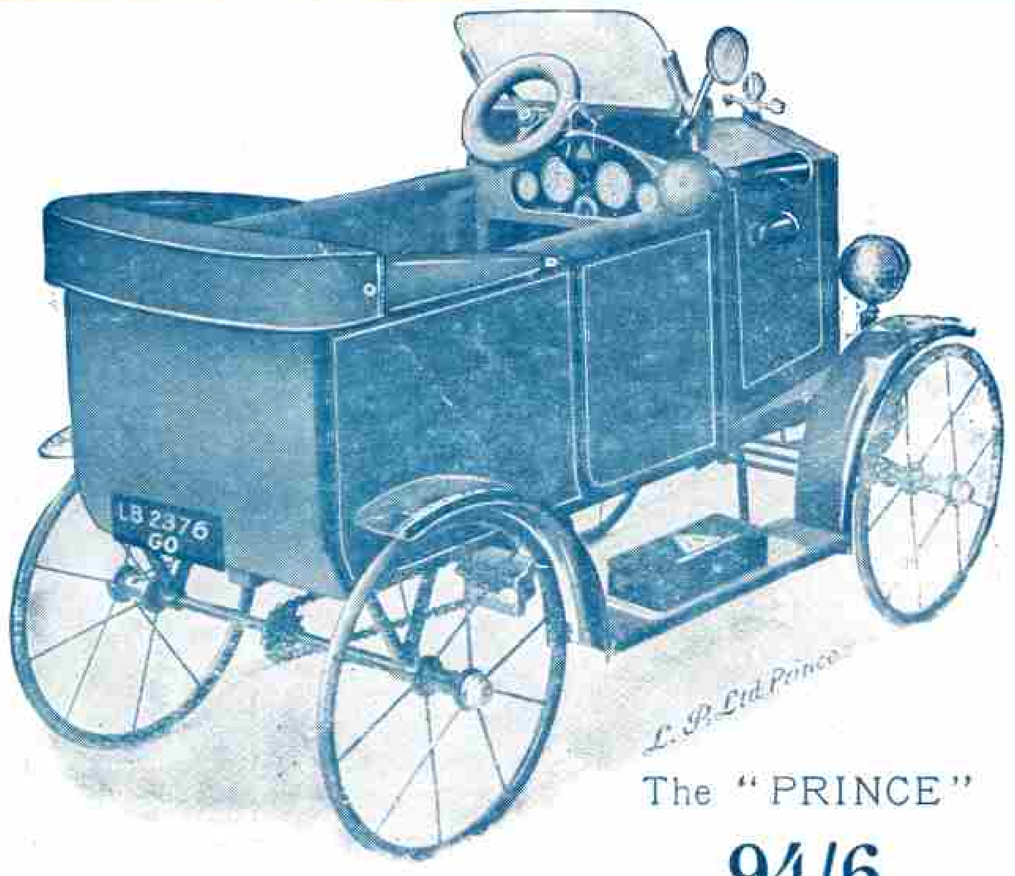
OBTAINABLE AT ALL GOOD TOY SHOPS



The "MORRIS"

78/9

The "MORRIS" is fully equipped with mudguards and adjustable windscreen, 2 head and 2 side lamps, bulb horn and driving mirror, licence plate, etc., 12" wired-on tyred wheels. Children up to 8 years.



The "PRINCE"

94/6

This luxurious model with the Rolls-Royce type radiator has everything the heart can desire, including instrument board with clock, speedometer, oil indicator, voltmeter and switch, dummy hood and tool box, etc., 12" wired-on tyred wheels. Children up to 10 years.

Always insist on seeing the celebrated Red and Black Triangle Trade Mark on all Toys. It is a guarantee of Quality and Value and of British Manufacture.

Wholesale only from

LINES BROS. LTD., 9, Fore St., London, E.C.

Footballers! Get your Kit at

GAMAGES

EVERY year shows that more and more are following the lead of many well-known Clubs by coming to Gamages for all supplies. For Gamages have for 25 years been recognised as the Premier Football Supply House of the World! This Year our Display is better and bigger than ever. So come along to Holborn — and come early—early-comers get first choice!

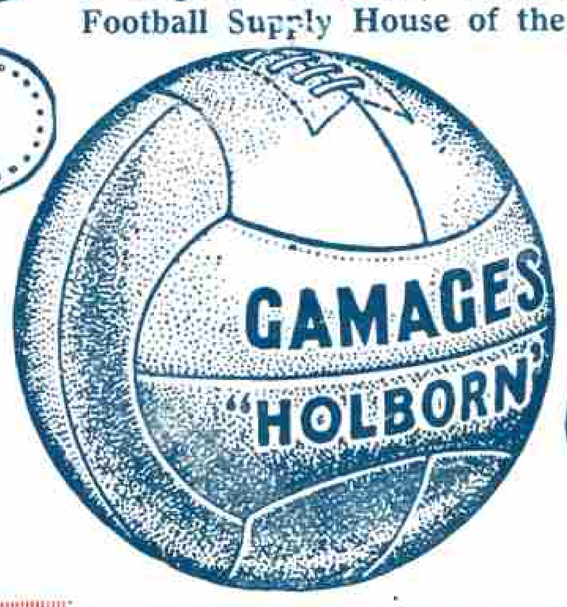
IF YOU WANT TO WIN

Wear a pair of Gamages Football Boots— the finest ever produced.

THE UNIVERSAL FOOTBALL BOOTS

(As illustrated.) Uppers of fine quality Brown Russet Leather and toes of Solid Blocked Butt Leather. A Boot with a MOVE in it—very comfortable and hard-wearing. Prices per pair.

Men's Sizes, 6—11 **10/9** Sizes 2—5 **9/9** Boys' Sizes, 11—1 **9/3**



YOUR CLUB JERSEY!

From their huge and varied stock of Football Jerseys and Shirts, Gamages can supply nearly every Club Colour. A list of Prices is given, and any Special Colours can be made to order in three to five weeks.

Vertical Striped Jerseys from **3/-**, Halves from **3/3**, Aston Villa **3/-**, Manchester United from **3/3**.

FOOTBALL SHORTS

Get a pair—more comfortable and better looking than others.

WHITE TWILL SHORTS with Elastic Waist.
Boys' Sizes, each **2/3** to **3/6**
Boys' Sizes, doz. **25/-** to **40/-**

DITTO IN NAVY TWILL
Boys' Sizes, each **2/3** to **3/-**
Boys' Sizes, doz. **25/6** to **33/-**

The 'HOLBORN' FOOTBALL

Here is one of Gamages most popular makes—made in Rugby or Association shape. Stout cowhide 12-panel cases. A strong serviceable ball complete with red rubber bladder. No. G. 3 **9/6**, No. G. 4 **9/11**, No. G. 5, Post 6d. Match size. ... **11/6**

This year we are offering our famous match-size School Ball at **8/11**.

THE BEST BALL FOR RUGBY

is Gamages "Defiance"—a good hardwearing Ball that will withstand the roughest use whilst keeping its shape. Fitted with best red rubber badder. Full Match Size. Price ... ... **13/6** Post 6d.

Rugby Match Ball, **10/6**

Gamage's have everything for the "Rugger" enthusiast—Jerseys, Shorts, Stockings, Boots, Scrum Caps—everything. They're all in our Sports Catalogue. Write for your copy NOW.

FOOTBALL STOCKINGS

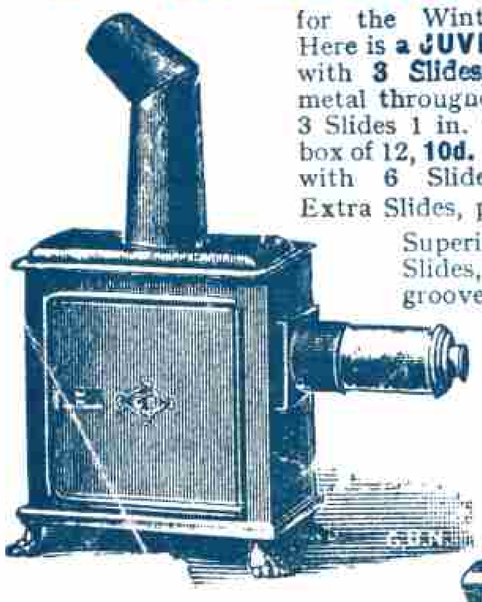
Always a large selection of Football Hose!

Stockings for Footer with ribbed legs and various coloured stripe tops.
Price per pair ... **1/9** Post 4d.
Per doz. pairs, **18/6** Post free

Superior Qualities, per pair, **2/9, 3/6, 3/9** and **4/9**.

RUGBY HOSE with 2" equal hoop stripes. Green and White, Black and White, Black and Red, Black and Amber. Per pair **5/6**
Per doz. pairs, **63/-**

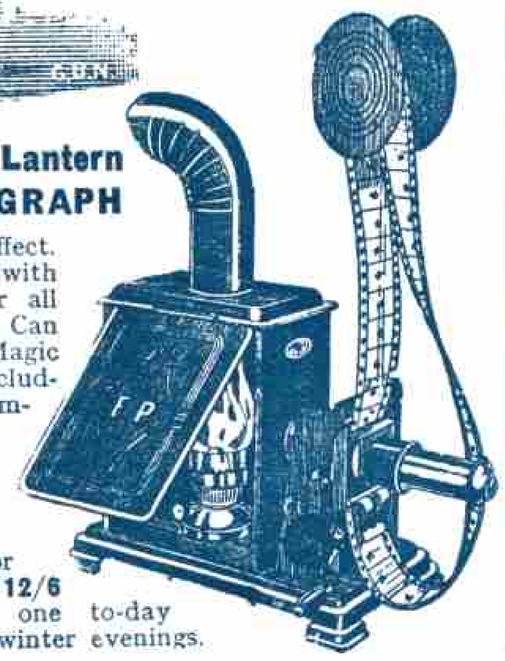
A SPLENDID HOBBY



for the Winter is "Home Movies." Here is a **JUVENILE MAGIC LANTERN** with **3 Slides, Oil Lamp** and Glass, metal throughout, **complete** in box with 3 Slides 1 in. wide **2/11**. Extra Slides, box of 12, **10d.** Superior quality, with 6 Slides, 1½ in. wide Extra Slides, per box of 12, **9d.** **5/9**

Superior quality, with 12 Glass Slides, 1⅝ in. wide (in separate grooved box), complete in handsome box **8/6**
Extra Slides, per box of 12, **1/-**
Postage 6d.

Combined Magic Lantern and CINEMATOGRAPH



Gives good optical effect. Reliable mechanism with fly wheel suitable for all standard size films. Can also be used as a Magic Lantern. Height including chimney, 7 ins. Complete with oil lamp, film and 3 slides. Price **5/6** Post 9d.

Larger Sizes, Superior quality. Prices **7/6, 12/6** and **21/-**. Send for one to-day and shorten the dull winter evenings.

Write now for your Copy of Gamages New 1924–5 Fully Illustrated

FOOTBALL CATALOGUE

It is the Big Book of British Sport—a book that no boy should be without. And besides Football, there's Hockey, Boxing, Gymnastics—every Winter Sport played. We will send you a Copy

POST FREE ON REQUEST

TAKE UP CHEMISTRY

You must have some hobbies for the wet evenings, so why not get a Chemistry Set at Gamages and start experimenting now?

Prices from **3/3** to **99/6**.

Neat Box of Chemicals with instructions, etc., complete for performing 50 experiments. Post 6d. Price **3/3**

Price for performing a larger number of experiments, etc. Post 6d. Price **5/6**

WIRELESS!

Another very good hobby for the Winter is Wireless. Here is your opportunity to buy a Wireless Set for **7/6**. You will never complain of the dull evenings with wireless installed in your house. Illustrated is the "Brownie" Crystal Set, with solid moulded ebonite cap and highest grade nickel fittings. Sold ready for use. British throughout, it will operate 4 pairs of phones. Price **7/6** Post 9d.

'Phones and Aerial Outfit extra.

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